Gratitude

In appreciation and gratitude
to The Custodian of the Two Holy Mosques

King Abdullah Bin Abdul Aziz Al Saud

And

H.R.H. Prince Sultan Bin Abdul Aziz Al Saud

Crown Prince, Deputy Premier, Minister of Defence
& Aviation and Inspector General

For their continuous support and gracious consideration,
the Saudi Building Code National Committee (SBCNC)
is honored to present the first issue of
the Saudi Building Code (SBC).

Saudi Building Code Requirements

201	Architectural	
301	Structural– Loading and Forces	
302	Structural– Testing and Inspection	
303	Structural– Soil and Foundations	
304	Structural– Concrete Structures	
305	Structural– Masonry Structures	
306	Structural– Steel Structures	
401	Electrical	
501	Mechanical	
601	Energy Conservation	
701	Sanitary	
801	Fire Protection	
901	Existing Buildings	

PREFACE

The Saudi Building Code (SBC) is a set of legal, administrative and technical regulations and requirements that specify the minimum standards of construction for building in order to ensure public safety and health. A Royal Decree dated 11th June 2000 order the formation of a national committee composed of representatives of Saudi universities and governmental and private sectors. In September 2001, the Council of Ministers approved the general plan of the National Committee to develop a national building code for the Kingdom of Saudi Arabia.

To choose a base code for the Saudi Building Code, a number of Codes have been studied. The National Committee has been acquainted with the results of the national researches and the international codes from the U.S.A., Canada and Australia, also, the European Code, and Arab Codes. It has also sought the opinions of specialists in relevant Saudi universities, governmental and private sectors through holding a questionnaire, a symposium and specialized workshops, in the light of which, (ICC) has been chosen to be a base code for the Saudi Building Code.

The International Code Council (ICC) grants permission to the Saudi Building Code National Committee (SBCNC) to include all or any portion of material from the ICC codes, and standards in the SBC and ICC is not responsible or liable in any way to SBCNC or to any other party or entity for any modifications or changes that SBCNC makes to such documents.

Toward expanding the participation of all the specialists in the building and construction industry in the Kingdom through the governmental and private sectors, the universities and research centers, the National Committee took its own decisions related to code content by holding specialized meetings, symposiums and workshops and by the help of experts from inside and outside of Saudi Arabia.

The technical committees and sub-committees started their work in April 2003 to develop the Saudi Building Code that adapts the base code with the social and cultural environment, the natural and climatic conditions, types of soil and properties of materials in the Kingdom.

The Saudi Building Code Architectural Requirements (SBC 201) were developed based on some chapters of the *International Building Code* (IBC), published by the ICC. These chapters include 2-6, 8, 10-12, 14, 15, 24-26, 33-35 and Appendix H.

The development process of SBC 201 followed the methodology that was approved by the Saudi Building Code National Committee with modifications to the IBC documents were intended to compose a comprehensive set of provisions, to the best possible extent, for materials, environmental conditions, and construction practices prevailing in the Kingdom.

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TABLE OF CONTENTS

CHAPTER 1
DEFINITIONS

SECTION 1.1
GENERAL

1.1.1 **Scope.** Unless otherwise expressly stated, the following words and terms shall, for the purposes of these requirements, have the meanings shown in this chapter.

1.1.2 **Interchangeability.** Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

1.1.3 **Terms defined in other codes.** Where terms are not defined in the code requirements and are defined in other SBC provisions and requirements, such terms shall have the meanings ascribed to them as in those provisions and requirements.

1.1.4 **Terms not defined.** Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

SECTION 1.2
DEFINITIONS

ACCESSIBLE. See Section 9.2.1.

ACCESSIBLE MEANS OF EGRESS. See Section 8.2.1.

ACCESSIBLE ROUTE. See Section 9.2.1.

ACCESSIBLE UNIT. See Section 9.2.

ADDITION. An extension or increase in floor area or height of a building or structure.

ADHERED MASONRY VENEER. See Section 5.2.1.

AEROSOL. See Section 2.7.2.

Level 1 aerosol products. See Section 2.7.2.
Level 2 aerosol products. See Section 2.7.2.
Level 3 aerosol products. See Section 2.7.2.

AEROSOL CONTAINER. See Section 2.7.2.

AGRICULTURAL, BUILDING. A structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products. This structure shall

not be a place of human habitation or a place of employment where agricultural products are processed, treated or packaged, nor shall it be a place used by the public.

AIR-INFLATED STRUCTURE. See Section 4.2.2.

AIR-SUPPORTED STRUCTURE. See Section 4.2.2.

Double skin. See Section 4.2.2.

Single skin. See Section 4.2.2.

AISLE ACCESSWAY. See Section 8.2.1.

ALLEY. See "Public way."

ALTERATION. Any construction or renovation to an existing structure other than repair or addition.

ALTERNATING TREAD DEVICE. See Section 8.2.1.

ANCHOR BUILDING. See Section 2.2.2.

ANCHORED MASONRY VENEER. See Section 5.2.1.

APPROVED. Acceptable to the building official.

APPROVED SOURCE. An independent person, firm or corporation, approved by the building official, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

AREA, BUILDING. See Section 3.2.1.

AREA OF REFUGE. See Section 8.2.1.

AREAWAY. A subsurface space adjacent to a building open at the top or protected at the top by a grating or guard.

ATRIUM. See Section 2.4.1.1.

ATTIC. The space between the ceiling beams of the top story and the roof rafters.

AWNING. An architectural projection that provides weather protection, identity or decoration and is wholly supported by the building to which it is attached. An awning is comprised of a lightweight, rigid skeleton structure over which a covering is attached.

BACKING. See Section 5.2.1.

BARRICADE. See Section 2.7.2.

Artificial barricade. See Section 2.7.2.

Natural barricade. See Section 2.7.2.

BASEMENT. That portion of a building that is partly or completely below grade (see "Story above grade plane" and Sections 2.2.1).

BLEACHERS. See Section 8.2.1.

BOARDING HOUSE. See Section 4.2.

BOILING POINT. See Section 2.7.2.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy.

BUILDING LINE. The line established by law, beyond which a building shall not extend, except as specifically provided by law.

BUILDING OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

BUILT-UP ROOF COVERING. See Section 6.2.1.

CABLE-RESTRAINED, AIR-SUPPORTED STRUCTURE. See Section 4.2.2.

CANOPY. An architectural projection that provides weather protection, identity or decoration and is supported by the building to which it is attached and at the outer end by not less than one stanchion. A canopy is comprised of a rigid structure over which a covering is attached.

CEMENT PLASTER. See Section 10.2.1.

CIRCULATION PATH. See Section 9.2.1.

CLADDING. See "Components and cladding."

CLOSED SYSTEM. See Section 2.7.2.

COMBUSTIBLE DUST. See Section 2.7.2.

COMBUSTIBLE FIBERS. See Section 2.7.2.

COMBUSTIBLE LIQUID. See Section 2.7.2.

Class II. See Section 2.7.2.

Class IIIA. See Section 2.7.2.

Class IIIB. See Section 2.7.2.

COMMON PATH OF EGRESS TRAVEL. See Section 8.2.1.

COMPRESSED GAS. See Section 2.7.2.

CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit.

CONSTRUCTION TYPES. See Section 4.2.

Type I. See Section 4.2.2.

Type II. See Section 4.2.2.

Type III. See Section 4.2.3.

Type IV. See Section 4.2.4.

Type V. See Section 4.2.5.

CONTINUOUS GAS-DETECTION SYSTEM. See Section 2.15.2.

CONTROL AREA. See Section 2.7.2.

CONTROLLED LOW-STRENGTH MATERIAL. A self-compacted, cementitious material used primarily as a backfill in place of compacted fill.

CORRIDOR. See Section 8.2.1.

CORROSION RESISTANCE. The ability of a material to withstand deterioration of its surface or its properties when exposed to its environment.

CORROSION RESISTANT. See Section 6.2.1.

CORROSIVE. See Section 2.7.2.

COURT. An open, uncovered space, unobstructed to the sky, bounded on three or more sides by exterior building walls or other enclosing devices.

COVERED MALL BUILDING. See Section 2.2.2.

CRYOGENIC FLUID. See Section 2.7.2.

DALLE GLASS. See Section 11.2.1.

DAMPER. Section 4B.2.1 (Referenced Chapter 4 of IBC 801).

DECORATIVE GLASS. See Section 11.2.1.

DEFLAGRATION. See Section 2.7.2.

[F] DETACHED STORAGE BUILDING. See Section 2.7.2.

DETECTABLE WARNING. See Section 9.2.1.

DETONATION. See Section 2.7.2.

DISPENSING. See Section 2.7.2.

DOOR, BALANCED. See Section 8.2.1.

DORMITORY. See Section 4.2.

DWELLING. A building that contains one or two dwelling units used, intended or designed to be used, rented, leased, let or hired out to be occupied for living purposes.

DWELLING UNIT. See Section 4.2.

DWELLING UNIT OR SLEEPING UNIT, MULTISTORY. See Section 9.2.

DWELLING UNIT OR SLEEPING UNIT, TYPE A. See Section 9.2.

DWELLING UNIT OR SLEEPING UNIT, TYPE B. See Section 9.2.

EDGE DISTANCE. See Section 1913.2.2.

[F] EMERGENCY CONTROL STATION. See Section 2.15.2.

EMERGENCY ESCAPE AND RESCUE OPENING. See Section 8.2.1.

EXISTING STRUCTURE. A structure erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued.

EXIT. See Section 8.2.1.

EXIT ACCESS. See Section 8.2.1.

EXIT DISCHARGE. See Section 8.2.1.

EXIT DISCHARGE, LEVEL OF. See Section 8.2.1.

EXIT ENCLOSURE. See Section 8.2.1.

EXIT PASSAGEWAY. See Section 8.2.1.

EXPANDED VINYL WALL COVERING. See Section 7.2.1.

[F] EXPLOSIVE. See Section 2.7.2.
- **High explosive.** See Section 2.7.2.
- **Low explosive.** See Section 2.7.2.
- **Mass detonating explosives.** See Section 2.7.2.

UN/DOTn Class 1 Explosives. See Section 2.7.2.
- **Division 1.1.** See Section 2.7.2.
- **Division 1.2.** See Section 2.7.2.
- **Division 1.3.** See Section 2.7.2.
- **Division 1.4.** See Section 2.7.2.
- **Division 1.5.** See Section 2.7.2.
- **Division 1.6.** See Section 2.7.2.

EXTERIOR SURFACES. See Section 10.2.1.

EXTERIOR WALL. See Section 5.2.1.

EXTERIOR WALL COVERING. See Section 5.2.1.

EXTERIOR WALL ENVELOPE. See Section 5.2.1.

FIRE PROTECTION RATING. See Section 4B.2.1 (Referenced Chapter 4 of IBC 801).

FIRE-RESISTANCE RATING. See Section 4B.2.1 (Referenced Chapter 4 of IBC 801).

FABRICATION AREA. See Section 2.27.2.

FACILITY. See Section 9.2.1.

FIREWORKS. See Section 2.7.2.

FIREWORKS, 1.3G. See Section 2.7.2.

FIREWORKS, 1.4G. See Section 2.7.2.

FLAME RESISTANCE. See Section 7.2.1.

FLAME SPREAD. See Section 7.2.1.

FLAME SPREAD INDEX. See Section 7.2.1.

FLAMMABLE GAS. See Section 2.7.2.

FLAMMABLE LIQUEFIED GAS. See Section 2.7.2.

FLAMMABLE LIQUID. See Section 2.7.2.
Class IA. See Section 2.7.2.
Class IB. See Section 2.7.2.
Class IC. See Section 2.7.2.

FLAMMABLE MATERIAL. See Section 2.7.2.

FLAMMABLE SOLID. See Section 2.7.2.

FLAMMABLE VAPORS OR FUMES. See Section 2.15.2.

FLASH POINT. See Section 2.7.2.

FLOOR AREA, GROSS. See Section 8.2.1.

FLOOR AREA, NET. See Section 8.2.1.

FLY GALLERY. See Section 2.22.2.

FOAM PLASTIC INSULATION. See Section 11.2.1.

FOLDING AND TELESCOPIC SEATING. See Section 8.2.1.

FOOD COURT. See Section 2.2.2.

GAS CABINET. See Section 2.27.2.

GAS ROOM. See Section 2.27.2.

GLASS FIBERBOARD. See Section 4B.21.1.1 (Referenced Chapter 4 of IBC 801).

GRADE FLOOR OPENING. A window or other opening located such that the sill height of the opening is not more than 1.2 meters above or below the finished ground level adjacent to the opening.

GRADE PLANE. See Section 3.2.1.

GRANDSTAND. See Section 8.2.1.

GRAVITY LOAD. The total dead load and applicable portions of other loads as defined in Sections 1613 through 1622.

GRIDIRON. See Section 2.22.2.

GROSS LEASABLE AREA. See Section 2.2.2.

GUARD. See Section 8.2.1.

GYPSUM BOARD. See Section 10.2.1.

GYPSUM PLASTER. See Section 10.2.1.

GYPSUM VENEER PLASTER. See Section 10.2.1.

HABITABLE SPACE. A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

[F] HANDLING. See Section 2.7.2.

HANDRAIL. See Section 8.2.1.

HARDBOARD. A fibrous-felted, homogeneous panel made from lignocellulosic fibers consolidated under heat and pressure in a hot press to a density not less than 31 pcf (497 lg/m^3).

HAZARDOUS CONTENTS. A material that is highly toxic or potentially explosive and in sufficient quantity to pose a significant life-safety threat to the general public if an uncontrolled release were to occur.

HAZARDOUS MATERIALS. See Section 2.7.2.

HAZARDOUS PRODUCTION MATERIAL (HPM). See Section 2.27.2.

HEALTH HAZARD. See Section 2.7.2.

HEIGHT, BUILDING. See Section 3.2.1.

HEIGHT, STORY. See Section 3.2.1.

HEIGHT, WALLS. See Section 2.1 (Referenced Chapter 2 of IBC 305).

HELIPORT. See Section 2B.12.5.2 (Referenced Chapter 2 of IBC 801).

HELISTOP. See Section 2B.12.5.2 (Referenced Chapter 2 of IBC 801).

HIGHLY TOXIC. See Section 2.7.2.

HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law (see Section 13.6).

HORIZONTAL EXIT. See Section 8.2.1.

HPM FLAMMABLE LIQUID. See Section 2.27.2.

HPM ROOM. See Section 2.27.2.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH). See Section 2.27.2.

INCOMPATIBLE MATERIALS. See Section 2.7.2.

INDUSTRIAL EQUIPMENT PLATFORM. See Section 3.2.1.

INTENDED TO BE OCCUPIED AS A RESIDENCE. See Section 9.2.

INTERIOR FINISH. See Section 7.2.1.

INTERIOR FLOOR FINISH. See Section 7.2.1.

INTERIOR SURFACES. See Section 10.2.1.

INTERIOR WALL AND CEILING FINISH. See Section 7.2.1.

INTERLAYMENT. See Section 6.2.1.

JURISDICTION. The governmental unit that has adopted this code under due legislative authority.

LIGHT-DIFFUSING SYSTEM. See Section 11.2.1.

LIGHT-FRAME CONSTRUCTION. A type of construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood or light gage steel framing members.

LIGHT-TRANSMITTING PLASTIC ROOF PANELS. See Section 11.2.1.

LIGHT-TRANSMITTING PLASTIC WALL PANELS. See Section 11.2.1.

LIQUID. See Section 2.27.2.

LIQUID STORAGE ROOM. See Section 2.27.2.

LIQUID USE, DISPENSING AND MIXING ROOMS. See Section 2.27.2.

LOT. A portion or parcel of land considered as a unit.

LOT LINE. A line dividing one lot from another, or from a street or any public place.

LOWER FLAMMABLE LIMIT (LFL). See Section 2.27.2.

LOWEST FLOOR. The floor of the lowest enclosed area, including basement, but excluding any unfinished or flood-resistant enclosure, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of this section.

MALL. See Section 2.2.2.

MARQUEE. A permanent roofed structure attached to and supported by the building and that projects into the public right-of-way.

MEANS OF EGRESS. See Section 8.2.1.

MECHANICAL-ACCESS OPEN PARKING GARAGES. See Section 2.6.3.2.

MECHANICAL EQUIPMENT SCREEN. See Section 6.2.1.

MEMBRANE-COVERED CABLE STRUCTURE. See Section 4.2.2.

MEMBRANE-COVERED FRAME STRUCTURE. See Section 4.2.2.

METAL COMPOSITE MATERIAL (MCM). See Section 5.2.

METAL COMPOSITE MATERIAL SYSTEM. See Section 5.2.

METAL ROOF PANEL. See Section 6.2.1.

METAL ROOF SHINGLE. See Section 6.2.1.

MEZZANINE. See Section 3.2.1.

MINERAL BOARD. See Section 4B.21.1.1 (Referenced Chapter 4 of IBC 801).

MODIFIED BITUMEN ROOF COVERING. See Section 6.2.1.

NONCOMBUSTIBLE MEMBRANE STRUCTURE. See Section 4.2.2.

NORMAL TEMPERATURE AND PRESSURE (NTP). See Section 2.27.2.

NOSING. See Section 8.2.1.

OCCUPANT LOAD. See Section 8.2.1.

OCCUPIABLE SPACE. A room or enclosed space designed for human occupancy in which individuals congregate for amusement, educational or similar purposes or in which occupants are engaged at labor, and which is equipped with means of egress and light and ventilation facilities meeting the requirements of this code.

OPEN PARKING GARAGE. See Section 2.6.3.2.

OPEN SYSTEM. See Section 2.7.2.

ORGANIC PEROXIDE. See Section 2.7.2.
Class I. See Section 2.7.2.
Class II. See Section 2.7.2.
Class III. See Section 2.7.2.
Class IV. See Section 2.7.2.
Class V. See Section 2.7.2.
Unclassified detonable. See Section 2.7.2.

OWNER. Any person, agent, firm or corporation having a legal or equitable interest in the property.

OXIDIZER. See Section 2.7.2.
Class 4. See Section 2.7.2.

Class 3. See Section 2.7.2.
Class 2. See Section 2.7.2.
Class 1. See Section 2.7.2.

OXIDIZING GAS. See Section 2.7.2.

PANIC HARDWARE. See Section 8.2.1.

PENTHOUSE. See Section 6.2.1.

PERMIT. An official document or certificate issued by the authority having jurisdiction which authorizes performance of a specified activity.

PERSON. An individual, heirs, executors, administrators or assigns, and also includes a firm, partnership or corporation, its or their successors or assigns, or the agent of any of the aforesaid.

PERSONAL CARE SERVICE. See Section 4.2.

PHYSICAL HAZARD. See Section 2.7.2.

PINRAIL. See Section 2.22.2.

PLASTIC, APPROVED. See Section 11.2.1.

PLASTIC GLAZING. See Section 11.2.1.

PLATFORM. See Section 2.22.2.

POSITIVE ROOF DRAINAGE. See Section 6.2.1.

PROSCENIUM WALL. See Section 4.10.2.

PUBLIC ENTRANCE. See Section 9.2.1.

PUBLIC-USE AREAS. See Section 9.2.1.

PUBLIC WAY. See Section 8.2.1.

PYROPHORIC. See Section 2.7.2.

PYROTECHNIC COMPOSITION. See Section 2.7.2.

RAMP. See Section 8.2.1.

RAMP-ACCESS OPEN PARKING GARAGES. See Section 2.6.3.2.

REGISTERED DESIGN PROFESSIONAL. An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

REINFORCED PLASTIC, GLASS FIBER. See Section 11.2.1.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

REROOFING. See Section 6.2.1.

RESIDENTIAL AIRCRAFT HANGAR. See Section 2B.12.3.1 (Referenced Chapter 2 of IBC 801).

RESIDENTIAL CARE/ASSISTED LIVING FACILITIES. See Section 4.2.

RETRACTABLE AWNING. See Section 4.5.2.

ROOF ASSEMBLY. See Section 6.2.1.

ROOF COVERING. See Section 6.2.1.

ROOF COVERING SYSTEM. See Section 6.2.1.

ROOF DECK. See Section 6.2.1.

ROOF RECOVER. See Section 6.2.1.

ROOF REPAIR. See Section 6.2.1.

ROOF REPLACEMENT. See Section 6.2.1.

ROOF VENTILATION. See Section 6.2.1.

ROOFTOP STRUCTURE. See Section 6.2.1.

SCISSOR STAIR. See Section 8.2.1.

SCUPPER. See Section 6.2.1.

SELF-SERVICE STORAGE FACILITY. See Section 9.2.1.

SERVICE CORRIDOR. See Section 2.27.2.

SERVICE ENTRANCE. See Section 9.2.1.

SINGLE-PLY MEMBRANE. See Section 6.2.1.

SITE. See Section 9.2.1.

SKYLIGHT, UNIT. A factory-assembled, glazed fenestration unit, containing one panel of glazing material that allows for natural lighting through an opening in the roof assembly while preserving the weather-resistant barrier of the roof.

SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls, are included in this definition.

SLEEPING UNIT. A room or space in which people sleep, which can also include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units.

SMOKE-PROTECTED ASSEMBLY SEATING. See Section 8.2.1.

SOLID. See Section 2.27.2.

SPECIAL AMUSEMENT BUILDING. See Section 2B.11.2 (Referenced Chapter 2 of IBC 801).

STAGE. See Section 4.10.2.

STAIR. See Section 8.2.1.

STAIRWAY. See Section 8.2.1.

STAIRWAY, EXTERIOR. See Section 8.2.1.

STAIRWAY, INTERIOR. See Section 8.2.1.

STAIRWAY, SPIRAL. See Section 8.2.1.

STEEP SLOPE. A roof slope greater than two units vertical in 12 units horizontal (17-percent slope).

STORAGE, HAZARDOUS MATERIALS. See Section 2.27.2.

STORY. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above (also see “Basement,” “Mezzanine” and Section 3.2.1). It is measured as the vertical distance from top to top of two successive tiers of beams or finished floor surfaces and, for the topmost story, from the top of the floor finish to the top of the ceiling joists or, where there is not a ceiling, to the top of the roof rafters.

STORY ABOVE GRADE PLANE. Any story having its finished floor surface entirely above grade plane, except that a basement shall be considered as a story above grade plane where the finished surface of the floor above the basement is:

1. More than 1.8 meters above grade plane;
2. More than 1.8 meters above the finished ground level for more than 50 percent of the total building perimeter; or
3. More than 3.6 meters above the finished ground level at any point.

STORY DRIFT RATIO. The story drift divided by the story height.

TECHNICALLY INFEASIBLE. See Section 13.2.

TENT. Any structure, enclosure or shelter which is constructed of canvas or pliable material supported in any manner except by air or the contents it protects.

THERMOPLASTIC MATERIAL. See Section 11.2.1.

THERMOSETTING MATERIAL. See Section 11.2.1.

TOXIC. See Section 2.7.2.

TRIM. See Section 7.2.1.

UNDERLAYMENT. See Section 6.2.1.

UNSTABLE (REACTIVE) MATERIAL. See Section 2.7.2.

Class 4. See Section 2.7.2.
Class 3. See Section 2.7.2.
Class 2. See Section 2.7.2.
Class 1. See Section 2.7.2.

USE (MATERIAL). See Section 2.27.2.

VAPOR-PERMEABLE MEMBRANE. A material or covering having a permeance rating of 52.9 x 10^{-10} kg/Pa.s.m^2 or greater, when tested in accordance with the dessicant method

using Procedure A of ASTM E 96. A vapor-permeable material permits the passage of moisture vapor.

VAPOR RETARDER. A vapor-resistant material, membrane or covering such as foil, plastic sheeting or insulation facing having a permeance rating of 5.7×10^{-11} kg/Pa·s·m^2 or less, when tested in accordance with the dessicant method using Procedure A of ASTM E 96. Vapor retarders limit the amount of moisture vapor that passes through a material or wall assembly.

VENEER. See Section 5.2.1.

VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

WALKWAY, PEDESTRIAN. A walkway used exclusively as a pedestrian trafficway.

WATER-REACTIVE MATERIAL. See Section 2.7.2.

Class 3. See Section 2.7.2.

Class 2. See Section 2.7.2.

Class 1. See Section 2.7.2.

WEATHER-EXPOSED SURFACES. See Section 10.2.1.

WEB. See Section 2102.1.

WHEELCHAIR SPACE. See Section 9.2.1.

WHEELCHAIR SPACE CLUSTER. See Section 9.2.1.

WIRE BACKING. See Section 10.2.1.

WORKSTATION. See Section 2.27.2.

WYTHE. See Section 2.1 (Referenced Chapter 2 of IBC 305).

YARD. An open space, other than a court, unobstructed from the ground to the sky, except where specifically provided by this code, on the lot on which a building is situated.

CHAPTER 2
USE AND OCCUPANCY CLASSIFICATION

SECTION 2.1
GENERAL

2.1.1 **Scope.** The provisions of this chapter shall control the classification of all buildings and structures as to use and occupancy.

SECTION 2.2
CLASSIFICATION

2.2.1 **General.** Structures or portions of structures shall be classified with respect to occupancy in one or more of the groups listed below. Structures with multiple uses shall be classified according to Section 2.2.3. Where a structure is proposed for a purpose which is not specifically provided for in this code requirements, such structure shall be classified in the group which the occupancy most nearly resembles, according to the fire safety and relative hazard involved.

1. Assembly (see Section 2.3): Groups A-1, A-2, A-3, A-4 and A-5
2. Business (see Section 2.4): Group B
3. Educational (see Section 2.5): Group E
4. Factory and Industrial (see Section 2.6): Groups F-1 and F-2
5. High Hazard (see Section 2.7): Groups H-1, H-2, H-3, H-4 and H-5
6. Institutional (see Section 2.8): Groups I-1, I-2, I-3 and I-4
7. Mercantile (see Section 2.9): Group M
8. Residential (see Section 2.10): Groups R-1, R-2, R-3 as applicable in Section 101.2, and R-4
9. Storage (see Section 2.11): Groups S-1 and S-2
10. Utility and Miscellaneous (see Section 2.12): Group U

2.2.1.1 **Incidental use areas.** Spaces which are incidental to the main occupancy shall be separated or protected, or both, in accordance with Table 2.2.1.1 or the building shall be classified as a mixed occupancy and comply with Section 2.2.3. Areas that are incidental to the main occupancy shall be classified in accordance with the main occupancy of the portion of the building in which the incidental use area is located.

Exception: Incidental use areas within and serving a dwelling unit are not required to comply with this section.

2.2.1.1.1 **Separation.** Where Table 2.2.1.1 requires a fire-resistance-rated separation, the incidental use area shall be separated from the remainder of the building with a fire barrier. Where Table 2.2.1.1 permits an automatic fire-extinguishing system without a fire barrier, the incidental use area shall be separated by construction capable of resisting the passage of smoke. The partitions shall extend from the floor to the underside of the fire-resistance-rated floor/ceiling assembly or fire-resistance-rated roof/ceiling assembly or to the underside of the floor or roof deck above. Doors shall be self-closing or automatic-closing upon detection of smoke. Doors shall not have air transfer openings and shall not be undercut in excess of the clearance permitted in accordance with NFPA 80.

2.2.2 **Accessory use areas.** A fire barrier shall be required to separate accessory use areas classified as Group H in accordance with Section 2.2.3.1, and incidental use areas in accordance with Section 2.2.1.1. Any other accessory use area shall not be

required to be separated by a fire barrier provided the accessory use area occupies an area not more than 10 percent of the area of the story in which it is located and does not exceed the tabular values in Table 5C.3 for the allowable height or area for such use.

2.2.2.1 **Assembly areas.** Accessory assembly areas are not considered separate occupancies if the floor area is equal to or less than 70 m^2. Assembly areas that are accessory to Group E are not considered separate occupancies. Accessory educational rooms, multi-purpose halls and auditoriums with occupant loads of less than 100 are not considered separate occupancies.

TABLE 2.2.1.1
INCIDENTAL USE AREAS

ROOM OR AREA	SEPARATION[a]
Furnace room where any piece of equipment is over 117 kW per hour input	1 hour or provide automatic fire-extinguishing system
Rooms with any boiler over 103.5 kPa and 7.5 kW	1 hour or provide automatic fire-extinguishing system
Refrigerant machinery rooms	1 hour or provide automatic sprinkler system
Parking garage (Section 2.6.2)	2 hours; or 1 hour and provide automatic fire-extinguishing system
Hydrogen cut-off rooms	1 hour fire barriers and floor/ceiling assemblies in Group B, F, H, M, S and U occupancies. 2 hours fire barriers and floor/ceiling assemblies in Group A, E, I and R occupancies.
Incinerator rooms	2 hours and automatic sprinkler system
Paint shops, not classified as Group H, located in occupancies other than Group F	2 hours; or 1 hour and provide automatic fire-extinguishing system
Laboratories and vocational shops, not classified as Group H, located in Group E or I-2 occupancies	1 hour or provide automatic fire-extinguishing system
Laundry rooms over 9 m^2	1 hour or provide automatic fire-extinguishing system
Storage rooms over 9 m^2	1 hour or provide automatic fire-extinguishing system
Group I-3 cells equipped with padded surfaces	1 hour
Group I-2 waste and linen collection rooms	1 hour
Waste and linen collection rooms over 9 m^2	1 hour or provide automatic fire-extinguishing system
Stationary lead-acid battery systems having a liquid capacity of more than 379 liters used for facility standby power, emergency power or uninterrupted power supplies	1 hour fire barriers and floor/ceiling assemblies in Group B, F, H, M, S and U occupancies. 2 hours fire barriers and floor/ceiling assemblies in Group A, E, I and R occupancies

a. Where an automatic fire-extinguishing system is provided, it need only be provided in the incidental use room or area.

2.2.3 **Mixed occupancies.** Where a building is occupied by two or more uses not included in the same occupancy classification, the building or portion thereof shall comply with Section 2.2.3.1 or 2.2.3.2 or a combination of these sections.

Exceptions:

1. Occupancies separated in accordance with Section 3.8.
2. Areas of Group H-2, H-3, H-4 or H-5 occupancies shall be separated from any other occupancy in accordance with Section 2.2.3.2.
3. Where required by Table 2.28.3.2, areas of Group H-1, H-2 or H-3 occupancy shall be located in a separate and detached building or structure.
4. Accessory use areas in accordance with Section 2.2.2.
5. Incidental use areas in accordance with Section 2.2.1.1.

2.2.3.1 **Non-separated uses.** Each portion of the building shall be individually classified as to use. The required type of construction for the building shall be determined by

applying the height and area limitations for each of the applicable occupancies to the entire building. The most restrictive type of construction, so determined, shall apply to the entire building. All other code requirements shall apply to each portion of the building based on the use of that space except that the most restrictive applicable provisions of Section 2.3 and Chapter 7 of the SBC 801 shall apply to these non-separated uses. Fire separations are not required between uses, except as required by other provisions.

2.2.3.2 **Separated uses.** Each portion of the building shall be individually classified as to use and shall be completely separated from adjacent areas by fire barrier walls or horizontal assemblies or both having a fire-resistance rating determined in accordance with Table 2.2.3.2 for uses being separated. Each fire area shall comply with this code requirements based on the use of that space. Each fire area shall comply with the height limitations based on the use of that space and the type of construction classification. In each story, the building area shall be such that the sum of the ratios of the floor area of each use divided by the allowable area for each use shall not exceed one.

Exception: Except for Group H and I-2 areas, where the building is equipped throughout with an automatic sprinkler system, installed in accordance with Section 7.3.3.1.1, the fire-resistance ratings in Table 2.2.3.3 shall be reduced by 1 hour but to not less than 1 hour and to not less than that required for floor construction according to the type of construction.

2.2.4 **Spaces used for different purposes.** A room or space that is intended to be occupied at different times for different purposes shall comply with all the requirements that are applicable to each of the purposes for which the room or space will be occupied.

SECTION 2.3
ASSEMBLY GROUP A

2.3.1 **Assembly Group A.** Assembly Group A occupancy includes, among others, the use of a building or structure, or a portion thereof, for the gathering together of persons for purposes such as civic, social or religious functions, recreation, food or drink consumption or awaiting transportation. A room or space used for assembly purposes by less than 50 persons and accessory to another occupancy shall be included as a part of that occupancy. Assembly areas with less than 70 m^2 and which are accessory to another occupancy according to Section 2.2.2.1 are not assembly occupancies. Assembly occupancies which are accessory to Group E in accordance with Section 2.2.2 are not considered assembly occupancies. Educational rooms, multi-purpose halls and auditoriums which are accessory to mosques in accordance with Section 2.2.2 and which have occupant loads of less than 100 shall be classified as A-3.

Assembly occupancies shall include the following:

A-1 Assembly uses, usually with fixed seating, intended for the production and viewing of the performing arts or motion pictures including, but not limited to:

Motion picture theaters
Symphony and concert halls
Television and radio studios admitting an audience
Theaters

TABLE 2.2.3.2
REQUIRED SEPARATION OF OCCUPANCIES (HOURS)[a]

USE	A-1	A-2	A-3	A-4	A-5	B[b]	E	F-1	F-2	H-1	H-2	H-3	H-4	H-5	I-1	I-2	I-3	I-4	M[b]	R-1	R-2	R-3, R-4	S-1	S-2[c]	U
A-1	---	2	2	2	2	2	2	3	2	NP	4	3	2	4	2	2	2	2	2	2	2	2	3	2	1
A-2	---	---	2	2	2	2	2	3	2	NP	4	3	2	4	2	2	2	2	2	2	2	2	3	2	1
A-3	---	---	---	2	2	2	2	3	2	NP	4	3	2	4	2	2	2	2	2	2	2	2	3	2	1
A-4	---	---	---	---	2	2	2	3	2	NP	4	3	2	4	2	2	2	2	2	2	2	2	3	2	1
A-5	---	---	---	---	---	2	2	3	2	NP	4	3	2	4	2	2	2	2	2	2	2	2	3	2	1
B[b]	---	---	---	---	---	---	2	3	2	NP	2	1	1	1	2	2	2	2	2	2	2	2	3	2	1
E	---	---	---	---	---	---	---	3	2	NP	4	3	2	3	2	2	2	2	2	2	2	2	3	2	1
F-1	---	---	---	---	---	---	---	---	3	NP	2	1	1	1	3	3	3	3	3	3	3	3	3	3	3
F-2	---	---	---	---	---	---	---	---	---	NP	2	1	1	1	2	2	2	2	2	2	2	2	3	2	1
H-1	---	---	---	---	---	---	---	---	---	---	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP1
H-2	---	---	---	---	---	---	---	---	---	---	---	1	2	2	4	4	4	4	2	4	4	4	2	2	1
H-3	---	---	---	---	---	---	---	---	---	---	---	---	1	1	4	3	3	3	1	3	3	3	1	1	1
H-4	---	---	---	---	---	---	---	---	---	---	---	---	---	1	4	4	4	4	1	4	4	4	1	1	1
H-5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4	4	4	3	1	4	4	4	1	1	3
I-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	2	2	2	2	2	2	4	3	2
I-2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	2	2	2	2	2	3	2	1
I-3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	2	2	2	2	3	2	1
I-4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	2	2	2	3	2	1
M[b]	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	2	2	3	2	1
R-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	2	3	2	1
R-2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	3	2	1
R3, R-4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	2[d]	1[d]
S-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	3
S-2[c]	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
U	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

NP = Not permitted.
a. See Exception 1 to Section 2.2.3.2 for reductions permitted.
b. Occupancy separation need not be provided for storage areas within Groups B and M if the:
1. Area is less than 10 percent of the floor area;
2. Area is provided with an automatic fire-extinguishing system and is less than 279 m^2; or
3. Area is less than 93 m^2.
c. Areas used only for private or pleasure vehicles shall be allowed to reduce separation by 1 hour.
d. See exception to Section 2.2.3.2.
e. Commercial kitchens need not be separated from the restaurant seating areas that they serve.

A-2 Assembly uses intended for food and/or drink consumption including, but not limited to:
Banquet halls
Restaurants
Cafes

A-3 Assembly uses intended for worship, recreation or amusement and other assembly uses not classified elsewhere in Group A including, but not limited to:
Amusement arcades
Art galleries
Bowling alleys
Mosques
Community halls
Courtrooms
Dance halls (not including food or drink consumption)
Exhibition halls
Funeral centers
Gymnasiums (without spectator seating)
Indoor swimming pools (without spectator seating)
Indoor tennis courts (without spectator seating)
Lecture halls
Libraries
Museums
Waiting areas in transportation terminals
Pool and billiard parlors

A-4 Assembly uses intended for viewing of indoor sporting events and activities with spectator seating including, but not limited to:
Arenas
Skating rinks
Swimming pools
Tennis courts

A-5 Assembly uses intended for participation in or viewing outdoor activities including, but not limited to:
Amusement park structures
Bleachers
Grandstands
Stadiums

2.3.1.1 **Non-accessory assembly use**. A building or tenant space used for assembly purposes by less than 50 persons shall be considered a Group B occupancy.

SECTION 2.4
BUSINESS GROUP B

2.4.1 **Business Group B.** Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts. Business occupancies shall include, but not be limited to, the following:
Airport traffic control towers
Animal hospitals, kennels and pounds
Banks
Barber and beauty shops
Car wash
Civic administration

Clinic–outpatient
Dry cleaning and laundries; pick-up and delivery stations and self-service
Educational occupancies above the 12th grade for male/female
Electronic data processing
Laboratories; testing and research
Motor vehicle showrooms
Post offices
Print shops
Professional services (architects, attorneys, dentists, physicians, engineers, etc.)
Radio and television stations
Telephone exchanges

SECTION 2.5
EDUCATIONAL GROUP E

2.5.1 **Educational Group E.** Educational Group E occupancy includes, among others, the use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade. Educational rooms, multi-purpose halls and auditoriums, which are accessory to mosques in accordance with Section 2.2.2 and have occupant loads of less than 100, shall be classified as A-3 occupancies.

2.5.2 **Day care. T**he use of a building or structure, or portion thereof, for educational, supervision or personal care services for more than five children older than $2^1/_2$ years of age, shall be classified as a Group E occupancy.

SECTION 2.6
FACTORY GROUP F

2.6.1 **Factory Industrial Group F**. Factory Industrial Group F occupancy includes, among others, the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy.

2.6.2 **Factory Industrial F-1 Moderate-Hazard Occupancy.** Factory industrial uses which are not classified as Factory Industrial F-2 Low Hazard shall be classified as F-1 Moderate Hazard and shall include, but not be limited to, the following:
Aircraft
Appliances
Athletic equipment
Automobiles and other motor vehicles
Bakeries
Medical Products over 12 percent alcohol content
Bicycles
Boats
Brooms or brushes
Business machines
Cameras and photo equipment
Canvas or similar fabric
Carpets and rugs (includes cleaning)
Clothing

Construction and agricultural machinery
Disinfectants
Dry cleaning and dyeing
Electric generation plants
Electronics
Engines (including rebuilding)
Food processing
Furniture
Hemp products
Jute products
Laundries
Leather products
Machinery
Metals
Millwork (sash & door)
Motion pictures and television filming (without spectators)
Musical instruments
Optical goods
Paper mills or products
Photographic film
Plastic products
Printing or publishing
Recreational vehicles
Refuse incineration
Shoes
Soaps and detergents
Textiles
Tobacco
Trailers
Upholstering
Wood; distillation
Woodworking (cabinet)

2.6.3 **Factory Industrial F-2 Low-Hazard Occupancy.** Factory industrial uses that involve the fabrication or manufacturing of noncombustible materials which during finishing, packing or processing do not involve a significant fire hazard shall be classified as F-2 occupancies and shall include, but not be limited to, the following:
Medical products; up to and including 12 percent alcohol content
Brick and masonry
Ceramic products
Foundries
Glass products
Gypsum
Ice
Metal products (fabrication and assembly)

SECTION 2.7
HIGH-HAZARD GROUP H

2.7.1 **High-Hazard Group H.** High-Hazard Group H occupancy includes, among others, the use of a building or structure, or a portion thereof, that involves the

manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those found in Tables 2.7.7(1) and 2.7.7(2) (see also definition of "Control area").

2.7.2 **Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code requirements, have the meanings shown herein.

AEROSOL. A product that is dispensed from an aerosol container by a propellant. Aerosol products shall be classified by means of the calculation of their chemical heats of combustion and shall be designated Level 1, 2 or 3.

Level 1 aerosol products. Those with a total chemical heat of combustion that is less than or equal to 20 kJ/g.

Level 2 aerosol products. Those with a total chemical heat of combustion that is greater than 20 kJ/g, but less than or equal to 30 kJ/g.

Level 3 aerosol products. Those with a total chemical heat combustion that is greater than 30 kJ/g.

AEROSOL CONTAINER. A metal can or a glass or plastic bottle designed to dispense an aerosol. Metal cans shall be limited to a maximum size of 1,000 ml. Glass or plastic bottles shall be limited to a maximum size of 118 ml.

BARRICADE. A structure that consists of a combination of walls, floor and roof, which is designed to withstand the rapid release of energy in an explosion and which is fully confined, partially vented or fully vented; or other effective method of shielding from explosive materials by a natural or artificial barrier.

Artificial barricade. An artificial mound or revetment a minimum thickness of 914 mm.

Natural barricade. Natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures that require protection cannot be seen from the magazine or building containing explosives when the trees are bare of leaves.

BOILING POINT. The temperature at which the vapor pressure of a liquid equals the atmospheric pressure of 101 kPa gage or 760 mm of mercury. Where an accurate boiling point is unavailable for the material in question, or for mixtures, which do not have a constant boiling point, for the purposes of this classification, the 20-percent evaporated point of a distillation performed in accordance with ASTM D 86, shall be used as the boiling point of the liquid.

CLOSED SYSTEM. The use of a solid or liquid hazardous material involving a closed vessel or system that remains closed during normal operations where vapors emitted by the product are not liberated outside of the vessel or system and the product is not exposed to the atmosphere during normal operations; and all uses of compressed gases. Examples of closed systems for solids and liquids include product conveyed through a piping system into a closed vessel, system or piece of equipment.

COMBUSTIBLE DUST. Finely divided solid material that is 420 microns or less in diameter and which, when dispersed in air in the proper proportions, could be ignited by a flame, spark or other source of ignition. Combustible dust will pass through a U.S. No. 40 standard sieve.

COMBUSTIBLE FIBERS. Readily ignitable and free-burning fibers, such as cocoa fiber, cloth, cotton, excelsior, hay, hemp, henequen, istle, jute, kapok, oakum, rags, sisal, Spanish moss, straw, tow, wastepaper or other like materials.

COMBUSTIBLE LIQUID. A liquid having a closed cup flash point at or above 38°C. Combustible liquids shall be subdivided as follows:

Class II. Liquids having a closed cup flash point at or above 38°C and below 60°C.

Class IIIA. Liquids having a closed cup flash point at or above 60°C and below 93°C.

Class IIIB. Liquids having a closed cup flash point at or above 93°C.

The category of combustible liquids does not include compressed gases or cryogenic fluids.

COMPRESSED GAS. A material, or mixture of materials which:

1. Is a gas at 20°C or less at 101 kPa of pressure; and
2. Has a boiling point of 20°C or less at 101 kPa which is either liquefied, non-liquefied or in solution, except those gases which have no other health or physical-hazard properties are not considered to be compressed until the pressure in the packaging exceeds 282 kPa at 20°C.

The states of a compressed gas are categorized as follows:

1. Non-liquefied compressed gases are gases, other than those in solution, which are in a packaging under the charged pressure and are entirely gaseous at a temperature of 20°C.
2. Liquefied compressed gases are gases that, in a packaging under the charged pressure, are partially liquid at a temperature of 20°C.
3. Compressed gases in solution are non-liquefied gases that are dissolved in a solvent.
4. Compressed gas mixtures consist of a mixture of two or more compressed gases contained in a packaging, the hazard properties of which are represented by the properties of the mixture as a whole.

CONTROL AREA. Spaces within a building that are enclosed and bounded by exterior walls, fire walls, fire barriers and roofs, or a combination thereof, where quantities of hazardous materials not exceeding the maximum allowable quantities per control area are stored, dispensed, used or handled.

CORROSIVE. A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the point of contact. A chemical shall be considered corrosive if, when tested on the intact skin of albino rabbits such a chemical destroys or changes irreversibly the structure of the tissue at the point of contact following an exposure period of 4 hours. This term does not refer to action on inanimate surfaces.

CRYOGENIC FLUID. A liquid having a boiling point lower than 101°C at an absolute pressure of 101 kPa.

DEFLAGRATION. An exothermic reaction, such as the extremely rapid oxidation of a flammable dust or vapor in air, in which the reaction progresses through the unburned material at a rate less than the velocity of sound. A deflagration can have an explosive effect.

DETACHED BUILDING. A separate single-story building, without a basement or crawl space, used for the storage or use of hazardous materials and located an approved distance from all structures.

DETONATION. An exothermic reaction characterized by the presence of a shock wave in the material which establishes and maintains the reaction. The reaction zone progresses through the material at a rate greater than the velocity of sound. The principal heating mechanism is one of shock compression. Detonations have an explosive effect.

DISPENSING. The pouring or transferring of any material from a container, tank or similar vessel, whereby vapors, dusts, fumes, mists or gases are liberated to the atmosphere.

EXPLOSIVE. Any chemical compound, mixture or device, the primary or common purpose of which is to function by explosion. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters and display fireworks, 1.3G (Class B, Special). The term “explosive” includes any material determined to be classified as an explosive other than consumer fireworks, 1.4G (Class C, Common) by the hazardous materials regulations.

High explosive. Explosive material, such as dynamite, which can be caused to detonate by means of a No. 8 test blasting cap when unconfined.

Low explosive. Explosive material that will burn or deflagrate when ignited. It is characterized by a rate of reaction that is less than the speed of sound. Examples of low explosives include, but are not limited to, black powder; safety fuse; igniters; igniter cord; fuse lighters; fireworks, 1.3G (Class B, Special) and propellants, 1.3C.

Mass-detonating explosives. Division 1.1, 1.2 and 1.5 explosives alone or in combination, or loaded into various types of ammunition or containers, most of which can be expected to explode virtually instantaneously when a small portion is subjected to fire, severe concussion, impact, the impulse of an initiating agent or the effect of a considerable discharge of energy from without. Materials that react in this manner represent a mass explosion hazard. Such an explosive will normally cause severe structural damage to adjacent objects. Explosive propagation could occur immediately to other items of ammunition and explosives stored sufficiently close to and not adequately protected from the initially exploding pile with a time interval short enough so that two or more quantities must be considered as one for quantity-distance purposes.

MOI (UN/DOTn) Class 1 explosive. The former classification system used by DOTn included the terms “high” and “low” explosives as defined herein. The following terms further define explosives under the current system applied by (DOTn for all explosive materials defined as hazard Class 1 materials. Compatibility group letters are used in concert with the division to specify further limitations on each division noted (i.e., the letter G identifies the material as a pyrotechnic substance or article containing a pyrotechnic substance and similar materials).

Division 1.1. Explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.

Division 1.2. Explosives that have a projection hazard but not a mass

explosion hazard.

Division 1.3. Explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

Division 1.4. Explosives that pose a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5. Very insensitive explosives. This division is comprised of substances that have a mass explosion hazard, but that are so insensitive there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

Division 1.6. Extremely insensitive articles which do not have a mass explosion hazard. This division is comprised of articles that contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

FIREWORKS. Any composition or device for the purpose of producing a visible or audible effect for entertainment purposes by combustion, deflagration or detonation that meets the definition of 1.4G fireworks or 1.3G fireworks as set forth herein.

FIREWORKS, 1.3G. (Formerly Class B, Special Fireworks.) Large fireworks devices, which are explosive materials, intended for use in fireworks displays and designed to produce audible or visible effects by combustion, deflagration or detonation. Such 1.3G fireworks include, but are not limited to, firecrackers containing more than 130 milligrams (2 grains) of explosive composition, aerial shells containing more than 40 grams of pyrotechnic composition, and other display pieces which exceed the limits for classification as 1.4G fireworks. Such 1.3G fireworks are also described as fireworks, 49 CFR (172) by the DOTn.

FIREWORKS, 1.4G. (Formerly Class C, Common Fireworks.) Small fireworks devices containing restricted amounts of pyrotechnic composition designed primarily to produce visible or audible effects by combustion. Such 1.4G fireworks, which comply with the construction, chemical composition and labeling regulations of the DOTn, 49 CFR (172) for fireworks, and the local Consumer Product Safety Commission (CPSC) as set forth in CPSC 16 CFR): Parts 1500 and 1507, are not explosive materials for the purpose of the code requirements.

FLAMMABLE GAS. A material that is a gas at 20°C or less at 101 kPa of pressure [a material that has a boiling point of (20°C or less at 101 kPa)] which:

1. Is ignitable at 101 kPa when in a mixture of 13 percent or less by volume with air; or
2. Has a flammable range at 101 kPa with air of at least 12 percent, regardless of the lower limit.

The limits specified shall be determined at 101 kPa of pressure and a temperature of 20°C in accordance with (ASTM E 681).

FLAMMABLE LIQUEFIED GAS. A liquefied compressed gas which, under a charged pressure, is partially liquid at a temperature of 20°C and which is flammable.

FLAMMABLE LIQUID. A liquid having a closed cup flash point below 38°C. Flammable liquids are further categorized into a group known as Class I liquids. The Class I category is subdivided as follows:

Class IA. Liquids having a flash point below 23°C and a boiling point below 38°C.

Class IB. Liquids having a flash point below 23°C and a boiling point at or above 38°C.

Class IC. Liquids having a flash point at or above 23°C and below 38°C.

The category of flammable liquids does not include compressed gases or cryogenic fluids.

FLAMMABLE MATERIAL. A material capable of being readily ignited from common sources of heat or at a temperature of 316°C or less.

FLAMMABLE SOLID. A solid, other than a blasting agent or explosive, that is capable of causing fire through friction, absorption or moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which has an ignition temperature below 100°C or which burns so vigorously and persistently when ignited as to create a serious hazard. A chemical shall be considered a flammable solid as determined in accordance with the test method of CPSC 16 CFR; Part 1500.44, if it ignites and burns with a self-sustained flame at a rate greater than 2.5 mm per second along its major axis.

FLASH POINT. The minimum temperature in degrees Fahrenheit at which a liquid will give off sufficient vapors to form an ignitable mixture with air near the surface or in the container, but will not sustain combustion. The flash point of a liquid shall be determined by appropriate test procedure and apparatus as specified in ASTM D 56, ASTM D 93 or ASTM D 3278.

HANDLING. The deliberate transport by any means to a point of storage or use.

HAZARDOUS MATERIALS. Those chemicals or substances that are physical hazards or health hazards as defined and classified in this section and the this code requirements , whether the materials are in usable or waste condition.

HEALTH HAZARD. A classification of a chemical for which there is statistically significant evidence that acute or chronic health effects are capable of occurring in exposed persons. The term “health hazard” includes chemicals that are toxic or highly toxic, and corrosive.

HIGHLY TOXIC. A material which produces a lethal dose or lethal concentration that falls within any of the following categories:

1. A chemical that has a median lethal dose (LD50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.
3. A chemical that has a median lethal concentration (LC50) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation

for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

Mixtures of these materials with ordinary materials, such as water, might not warrant classification as highly toxic. While this system is basically simple in application, any hazard evaluation that is required for the precise categorization of this type of material shall be performed by experienced, technically competent persons.

INCOMPATIBLE MATERIALS. Materials that, when mixed, have the potential to react in a manner that generates heat, fumes, gases or byproducts which are hazardous to life or property.

OPEN SYSTEM. The use of a solid or liquid hazardous material involving a vessel or system that is continuously open to the atmosphere during normal operations and where vapors are liberated, or the product is exposed to the atmosphere during normal operations. Examples of open systems for solids and liquids include dispensing from or into open beakers or containers, dip tank and plating tank operations.

OPERATING BUILDING. A building occupied in conjunction with the manufacture, transportation or use of explosive materials. Operating buildings are separated from one another with the use of intraplant or intraline distances.

ORGANIC PEROXIDE. An organic compound that contains the bivalent structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms have been replaced by an organic radical. Organic peroxides can pose an explosion hazard (detonation or deflagration) or they can be shock sensitive. They can also decompose into various unstable compounds over an extended period of time.

Class I. Those formulations that are capable of deflagration but not detonation.

Class II. Those formulations that burn very rapidly and that pose a moderate reactivity hazard.

Class III. Those formulations that burn rapidly and that pose a moderate reactivity hazard.

Class IV. Those formulations that burn in the same manner as ordinary combustibles and that pose a minimal reactivity hazard.

Class V. Those formulations that burn with less intensity than ordinary combustibles or do not sustain combustion and that pose no reactivity hazard.

Unclassified detonable. Organic peroxides that are capable of detonation. These peroxides pose an extremely high explosion hazard through rapid explosive decomposition.

OXIDIZER. A material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion of combustible materials. Examples of other oxidizing gases include bromine, chlorine and fluorine.

Class 4. An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical shock. Additionally, the oxidizer will enhance the burning rate and can cause spontaneous ignition of combustibles.

Class 3. An oxidizer that will cause a severe increase in the burning rate of combustible materials with which it comes in contact or that will undergo vigorous self-sustained decomposition due to contamination or exposure to

heat.

Class 2. An oxidizer that will cause a moderate increase in the burning rate or that causes spontaneous ignition of combustible materials with which it comes in contact.

Class 1. An oxidizer whose primary hazard is that it slightly increases the burning rate but which does not cause spontaneous ignition when it comes in contact with combustible materials.

OXIDIZING GAS. A gas that can support and accelerate combustion of other materials.

PHYSICAL HAZARD. A chemical for which there is evidence that it is a combustible liquid, compressed gas, cryogenic, explosive, flammable gas, flammable liquid, flammable solid, organic peroxide, oxidizer, pyrophoric or unstable (reactive) or water-reactive material.

PYROPHORIC. A chemical with an auto-ignition temperature in air, at or below a temperature of 54°C.

PYROTECHNIC COMPOSITION. A chemical mixture that produces visible light displays or sounds through a self-propagating, heat-releasing chemical reaction which is initiated by ignition.

TOXIC. A chemical falling within any of the following categories:

1. A chemical that has a median lethal dose (LD50) of more than 50 milligrams per kilogram, but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

2. A chemical that has a median lethal dose (LD50) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.

3. A chemical that has a median lethal concentration (LC50) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than 2 milligrams per liter but not more than 20 milligrams per liter of mist, fume or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

UNSTABLE (REACTIVE) MATERIAL. A material, other than an explosive, which in the pure state or as commercially produced, will vigorously polymerize, decompose, condense or become self-reactive and undergo other violent chemical changes, including explosion, when exposed to heat, friction or shock, or in the absence of an inhibitor, or in the presence of contaminants, or in contact with incompatible materials. Unstable (reactive) materials are subdivided as follows:

Class 4. Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures. This class includes materials that are sensitive to mechanical or localized thermal shock at normal temperatures and pressures.

Class 3. Materials that in themselves are capable of detonation or of explosive decomposition or explosive reaction but which require a strong initiating

source or which must be heated under confinement before initiation. This class includes materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures.

Class 2. Materials that in themselves are normally unstable and readily undergo violent chemical change but do not detonate. This class includes materials that can undergo chemical change with rapid release of energy at normal temperatures and pressures, and that can undergo violent chemical change at elevated temperatures and pressures.

Class 1. Materials that in themselves are normally stable but which can become unstable at elevated temperatures and pressure.

WATER-REACTIVE MATERIAL. A material that explodes; violently reacts; produces flammable, toxic or other hazardous gases; or evolves enough heat to cause self-ignition or ignition of nearby combustibles upon exposure to water or moisture. Water-reactive materials are subdivided as follows:

Class 3. Materials that react explosively with water without requiring heat or confinement.

Class 2. Materials that may form potentially explosive mixtures with water.

Class 1. Materials that may react with water with some release of energy, but not violently.

2.7.3 **High-Hazard Group H-1.** Buildings and structures which contain materials that present a detonation hazard shall be classified as Group H-1. Such materials shall include, but not be limited to, the following:

Explosives:

Division 1.1

Division 1.2

Division 1.3

Exception: Materials that are used and maintained in a form where either confinement or configuration will not elevate the hazard from a mass fire to mass explosion hazard shall be allowed in H-2 occupancies.

Division 1.4

Exception: Articles, including articles packaged for shipment, that are not regulated as an explosive under Bureau of Alcohol, Tobacco and Firearms regulations, or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles shall be allowed in H-3 occupancies.

Division 1.5

Division 1.6

Organic peroxides, unclassified detonable

Oxidizers, Class 4

Unstable (reactive) materials, Class 3 detonable and Class 4

Detonable pyrophoric materials

2.7.4 **High-Hazard Group H-2.** Buildings and structures which contain materials that present a deflagration hazard or a hazard from accelerated burning shall be classified as Group H-2. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids which are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 103.4 kPa gage.

Combustible dusts

Cryogenic fluids, flammable
Flammable gases
Organic peroxides, Class I
Oxidizers, Class 3, that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 1,03.3 kPa gage
Pyrophoric liquids, solids and gases, nondetonable
Unstable (reactive) materials, Class 3, nondetonable
Water-reactive materials, Class 3

2.7.5 **High-Hazard Group H-3.** Buildings and structures that contain materials that readily support combustion or present a physical hazard shall be classified as Group H-3. Such materials shall include, but not be limited to, the following:
Class I, II or IIIA flammable or combustible liquids which are used or stored in normally closed containers or systems pressurized at less than 15 psi (103 kPa) gage.
Combustible fibers
Consumer fireworks, 1.4G (Class C Common)
Cryogenic fluids, oxidizing
Flammable solids
Organic peroxides, Classes II and III
Oxidizers, Classes 1 and 2
Oxidizing gases
Unstable (reactive) materials, Class 2
Water-reactive materials, Class 2

2.7.6 **High-Hazard Group H-4.** Buildings and structures which contain materials that are health hazards shall be classified as Group H-4. Such materials shall include, but not be limited to, the following:
Corrosives
Highly toxic materials
Toxic materials

2.7.7 **Group H-5 structures.** Semiconductor fabrication facilities and comparable research and development areas in which hazardous production materials (HPM) are used and the aggregate quantity of materials is in excess of those listed in Tables 2.7.7(1) and 2.7.7(2). Such facilities and areas shall be designed and constructed in accordance with Section 2.15.9.

2.7.8 **Multiple hazards.** Buildings and structures containing a material or materials representing hazards that are classified in one or more of Groups H-1, H-2, H-3 and H-4 shall conform to the code requirements for each of the occupancies so classified.

2.7.9 **Exceptions:** The following shall not be classified in Group H, but shall be classified in the occupancy which they most nearly resemble. Hazardous materials in any quantity shall conform to the requirements of this code, including Section 2.14.

1. Buildings and structures that contain not more than the maximum allowable quantities per control area of hazardous materials as shown in Tables 2.7.7(1) and 2.7.7(2) provided that such buildings are maintained in accordance with this code requirements.
2. Buildings utilizing control areas in accordance with Section 2.14.2 that contain not more than the maximum allowable quantities per control area of hazardous materials as shown in Tables 2.7.7(1) and 2.7.7(2).

3. Buildings and structures occupied for the application of flammable finishes, provided that such buildings or areas conform to the requirements of Section 216 and this code requirements.

TABLE 2.7.7(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD[a, j, m]

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE[b]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
			Solid kgs (cubic meters)	Liquid liters (kgs)	Gas cubic meters at NTP	Solid kgs (cubic meters)	Liquid liters (kgs)	Gas cubic meters at NTP	Solid kgs (cubic meters)	Liquid liters (kgs)
Combustible liquid[c, i]	II IIIA IIIB	H-2 or H-3 H-2 or H-3 Not Applicable	Not Applicable	454[d, e] 1,249[d, e] 49,962[e, f]	Not Applicable	Not Applicable	454[d] 1,249[d] 49,962[f]	Not Applicable	Not Applicable	114[d] 303[d] 12,491[f]
Combustible	Loose Baled	H-3	(2.8) (28)	Not Applicable	Not Applicable	(2.8) (28)	Not Applicable	Not Applicable	(0.57) (5.7)	Not Applicable
Cryogenic Flammable	Not Applicable	H-2	Not Applicable	170[d]	Not Applicable	Not Applicable	170[d]	Not Applicable	Not Applicable	38[d]
Consumer fireworks (Class C Common)	1.4G	H-3	56.8[d, e, l]	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cryogenic Oxidizing	Not Applicable	H-3	Not Applicable	170[d]	Not Applicable	Not Applicable	170[d]	Not Applicable	Not Applicable	38[d]
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4 Division 1.4G Division 1.5 Division 1.6	H-1 H-1 H-1 or H-2 H-3 H-3 H-1 H-1	0.45[e, g] 0.45[e, g] 2.3[e, g] 22.7[e, g] 56.8[e, g, l] 0.45[e, g] 0.45[d, e, g]	(0.45)[e, g] (0.45)[e, g] (2.3)[e, g] (22.7)[e, g] Not Applicable (0.45)[e, g] Not Applicable	Not Applicable	0.114[g] 0.114[g] 0.45[g] 22.7[g] Not Applicable 0.114[g] Not Applicable	(0.114)[g] (0.114)[g] (0.45)[g] (22.7)[g] Not Applicable (0.114)[g] Not Applicable	Not Applicable	0.114[g] 0.114[g] 0.45[g] Not Applicable Not Applicable 0.114[g] Not Applicable	(0.114)[g] (0.114)[g] (0.45)[g] Not Applicable Not Applicable (0.114)[g] Not Applicable
Flammable gas	Gaseous Liquefied	H-2	Not Applicable	Not Applicable 114[d, e]	28[d, e] Not Applicable	Not Applicable	Not Applicable 114[d, e]	28[d, e] Not Applicable	Not Applicable	Not Applicable
Flammable liquids[c]	IA IB and IC	H-2 or H-3	Not Applicable	114[d, e] 454[d, e]	Not Applicable	Not Applicable	114[d] 454[d]	Not Applicable	Not Applicable	38[d] 114[d]
Combination Flammable liquid (IA, IB, IC)	Not Applicable	H2 or H-3	Not Applicable	454[d, e, h]	Not Applicable	Not Applicable	454[d, h]	Not Applicable	Not Applicable	114[d, h]
Flammable solid	Not Applicable	H-3	54.5[d, e]	Not Applicable	Not Applicable	56.8[d]	Not Applicable	Not Applicable	11.4[d]	Not Applicable
Organic peroxide	UD I II III IV V	H-1 H-2 H-3 H-3 Not Applicable Not Applicable	0.45[e, g] 2.3[d, e] 22.7[d, e] 56.8[d, e] Not limited Not limited	(0.45)[e, g] (2.3)[d, e] (22.7)[d, e] (56.8)[d, e] Not limited Not limited	Not Applicable	0.114[g] 0.45[d] 22.7[d] 56.8[d] Not limited Not limited	(0.114)[g] (0.45)[d] (22.7)[d] (56.8)[d] Not limited Not limited	Not Applicable	0.114[g] 0.45[d] 4.5[d] 11.4[d] Not limited Not limited	(0.114)[g] (0.45)[d] (4.5)[d] (11.4)[d] Not limited Not limited

(continued)

TABLE 2.7.7(1)—(continued)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD[a, j, m]

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE[b]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
			Solid kgs (cubic meters)	Liquid liters (kgs)	Gas cubic meters at NTP	Solid kgs (cubic meters)	Liquid liters (kgs)	Gas cubic meters at NTP	Solid kgs (cubic meters)	Liquid liters (kgs)
Oxidizer	4	H-1	0.45[g]	(0.45)[e, g]	Not Applicable	0.114[g]	(0.114)[g]	Not Applicable	0.114[g]	(0.114)[g]
	3[k]	H-2	4.5[d, e]	(4.5)[d, e]		0.9[d]	(0.9)[d]		0.9[d]	(0.9)[d]
	2	H-3	113.5[d, e]	(113.5)[d, e]		113.5[d]	(113.5)[d]		22.7[d]	(22.7)[d]
	1	H-3	1,816[e, f]	(1,816)[e, f]		1,816[f]	(1,816)[f]		454[f]	(454)[f]
Oxidizing gas	Gaseous	H-3	Not Applicable	Not Applicable	42.5[d, e]	Not Applicable	Not Applicable	42.5[d, e]	Not Applicable	Not Applicable
	Liquefied			57[d, e]	Not Applicable		57[d, e]	Not Applicable		
Pyrophoric	Not Applicable	H-2	1.8[e, g]	(1.8)[e, g]	1.42[e, g]	0.45[g]	(0.45)[g]	0.28[e, g]	0	0
Unstable (reactive)	4	H-1	0.45[e, g]	(0.45)[e, g]	0.28[e, g]	0.114[g]	(0.114)[g]	0.057[e, g]	0.114[g]	(0.114)[g]
	3	H-1 or H-2	2.3[d, e]	(2.3)[d, e]	1.42[d, e]	0.45[d]	(0.45)[d]	0.28 [d, e]	0.45[d]	(0.45)[d]
	2	H-3	22.7[d, e]	(22.7)[d, e]	7.1[d, e]	22.7[d]	(22.7)[d]	7.1[d, e]	4.5[d]	(4.5)[d]
	1	Not Applicable	Not Limited	Not Limited	Not Limited	Not Limited	Not Limited	Not Limited	Not Limited	Not Limited
Water reactive	3	H-2	2.3[d, e]	(2.3)[d, e]	Not Applicable	2.3[d]	(2.3)[d]	Not Applicable	0.45[d]	(0.45)[d]
	2	H-3	22.7[d, e]	(22.7)[d, e]		22.7[d]	(22.7)[d]		4.5[d]	(4.5)[d]
	1	Not Applicable	Not Limited	Not Limited		Not Limited	Not Limited		Not Limited	Not Limited

NL = Not Limited; N/A = Not Applicable; UD = Unclassified Detonable

a. For use of control areas, see Section 2.14.2.
b. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.
c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited providing the liquids are packaged in individual containers not exceeding 5 liters. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs, consumer or industrial products, and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 5 liters.
d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.
e. Quantities shall be increased 100 percent when stored in approved cabinets, gas cabinets, exhausted enclosures or safety cans as specified in this code *requirements*. Where Note d also applies, the increase for both notes shall be applied accumulatively.
f. The permitted quantities shall not be limited in a building equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1.
g. Permitted only in buildings equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1.
h. Containing not more than the maximum allowable quantity per control area of Class IA, IB or IC flammable liquids.
i. Inside a building, the maximum capacity of a combustible liquid storage system that is connected to a fuel-oil piping system shall be 2,498 liters provided such system conforms to *this code requirements*.
j. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.
k. A maximum quantity of 91 kilograms of solid or 76 liters of liquid Class 3 oxidizers is allowed when such materials are necessary for maintenance purposes, operation or sanitation of equipment. Storage containers and the manner of storage shall be approved.
l. Net weight of the pyrotechnic composition of the fireworks. Where the net weight of the pyrotechnic composition of the fireworks is not known, 25 percent of the gross weight of the fireworks, including packaging, shall be used.
m. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 2.14.2.4, see Table 2.14.2.4.

TABLE 2.7.7(2)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A HEALTH HAZARD[a,b,c]

MATERIAL	STORAGE[d]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
	Solid kgs[e, f]	Liquid liters (kgs)[e, f]	Gas cubic meters[e]	Solid kgs[e]	Liquid liters (kgs)[e]	Gas cubic meters[e]	Solid kgs[e]	Liquid liters (kgs)[e]
Corrosive	2,270	1,893	23[f, g]	2,270	1,893	23[f, g]	454	379
Highly toxic	4.5	(4.5)[i]	0.57[h]	4.5	(4.5)[i]	0.57[h]	1.4	(1.4)[i]
Toxic	227	(227)[i]	23[f]	227	(227)[i]	23[f]	56.8	(56.8)[i]

a. For use of control areas, see Section 2.14.2.
b. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs consumer or industrial products, and cosmetics, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 5 liters.
c. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 2.14.2.4, see Table 2.14.2.4.
d. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.
e. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 7.3.3.1.1. Where Note f also applies, the increase for both notes shall be applied accumulatively.
f. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, gas cabinets, or exhausted enclosures. Where Note e also applies, the increase for both notes shall be applied accumulatively.
g. A single cylinder containing 68 kilograms or less of anhydrous ammonia in a single control area in a nonsprinklered building shall be considered a maximum allowable quantity. Two cylinders, each containing 68 kilograms or less in a single control area shall be considered a maximum allowable quantity provided the building is equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1.
h. Allowed only when stored in approved exhausted gas cabinets or exhausted enclosures.
i. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.

4. Wholesale and retail sales and storage of flammable and combustible liquids in mercantile occupancies conforming to this code requirements.
5. Closed systems housing flammable or combustible liquids or gases utilized for the operation of machinery or equipment.
6. Cleaning establishments that utilize combustible liquid solvents having a flash point of 60°C or higher in closed systems employing equipment listed by an approved testing agency, provided that this occupancy is separated from all other areas of the building by 1 hour fire-resistance-rated fire barrier walls or horizontal assemblies or both.
7. Cleaning establishments which utilize a liquid solvent having a flash point at or above 93°C.
8. Refrigeration systems.
9. The storage or utilization of materials for agricultural purposes on the premises.
10. Stationary batteries utilized for facility emergency power, uninterrupted power supply or telecommunication facilities provided that the batteries are provided with safety venting caps and ventilation is provided in accordance with the SBC 501.
11. Corrosives shall not include personal or household products in their original packaging used in retail display or commonly used building materials.
12. Buildings and structures occupied for aerosol storage shall be classified as Group S-1, provided that such buildings conform to the requirements of this code requirements.
13. Display and storage of nonflammable solid and nonflammable or noncombustible liquid hazardous materials in quantities not exceeding the maximum allowable quantity per control area in Group M or S occupancies complying with Section 214.2.4 (Hazardous Materials).
14. The storage of black powder, smokeless propellant and small arms primers in Groups M and R-3 and special industrial explosive devices in Groups B, F, M and S, provided such storage conforms to the quantity limits and requirements prescribed in this code requirements.

SECTION 2.8
INSTITUTIONAL GROUP I

2.8.1 **Institutional Group I.** Institutional Group I occupancy includes, among others, the use of a building or structure, or a portion thereof, in which people are cared for or live in a supervised environment, having physical limitations because of health or age are harbored for medical treatment or other care or treatment, or in which people are detained for penal or correctional purposes or in which the liberty of the occupants is restricted. Institutional occupancies shall be classified as Group I-1, I-2, I-3 or I-4.

2.8.2 **Group I-1.** This occupancy shall include buildings, structures or parts thereof housing more than 16 persons, on a 24 hours basis, who because of age, mental disability or other reasons, live in a supervised residential environment that provides personal care services. The occupants are capable of responding to an emergency situation without physical assistance from staff. This group shall include, but not be limited to, the following:
Residential board and care facilities
Assisted living facilities
Halfway houses

Group homes
Congregate care facilities
Social rehabilitation facilities
Alcohol and drug treatment centers
Convalescent facilities
A facility such as the above with five or fewer persons shall be classified as a Group R-3 or shall comply with SBC 100. A facility such as above, housing at least six and not more than 16 persons, shall be classified as Group R-4.

2.8.3 **Group I-2.** This occupancy shall include buildings and structures used for medical, surgical, psychiatric, nursing or custodial care on a 24 hours basis of more than five persons who are not capable of self-preservation. This group shall include, but not be limited to, the following:
Hospitals
Nursing homes (both intermediate-care facilities and skilled nursing facilities)
Mental hospitals
Detoxification facilities
A facility such as the above with five or fewer persons shall be classified as Group R-3 or shall comply with SBC 100.

2.8.3.1 **Child care facility.** A child care facility that provides care on a 24 hours basis to more than five children 2½ years of age or less shall be classified as Group I-2.

2.8.4 **Group I-3.** This occupancy shall include buildings and structures that are inhabited by more than five persons who are under restraint or security. An I-3 facility is occupied by persons who are generally incapable of self-preservation due to security measures not under the occupants' control. This group shall include, but not be limited to, the following:
Prisons
Jails Reformatories
Detention centers
Correctional centers
Prerelease centers
Buildings of Group I-3 shall be classified as one of the occupancy conditions indicated in Sections 2.8.4.1 through 2.8.4.5 (see Section 2.8.1).

2.8.4.1 **Condition 1.** This occupancy condition shall include buildings in which free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via means of egress without restraint. A Condition 1 facility is permitted to be constructed as Group R.

2.8.4.2 **Condition 2.** This occupancy condition shall include buildings in which free movement is allowed from sleeping areas and any other occupied smoke compartment to one or more other smoke compartments. Egress to the exterior is impeded by locked exits.

2.8.4.3 **Condition 3.** This occupancy condition shall include buildings in which free movement is allowed within individual smoke compartments, such as within a residential unit comprised of individual sleeping units and group activity spaces, where egress is impeded by remote-controlled release of means of egress from such a smoke compartment to another smoke compartment.

2.8.4.4 **Condition 4.** This occupancy condition shall include buildings in which free movement is restricted from an occupied space. Remote-controlled release is provided to permit movement from sleeping units, activity spaces and other occupied areas within the smoke compartment to other smoke compartments.

2.8.4.5 **Condition 5.** This occupancy condition shall include buildings in which free

movement is restricted from an occupied space. Staff-controlled manual release is provided to permit movement from sleeping units, activity spaces and other occupied areas within the smoke compartment to other smoke compartments.

2.8.5 **Group I-4, day care facilities.** This group shall include buildings and structures occupied by persons of any age who receive custodial care for less than 24 hours by individuals other than parents or guardians, relatives by blood, marriage or orphanage, and in a place other than the home of the person cared for. A facility such as the above with five or fewer persons shall be classified as a Group R-3 or shall comply with SBC 100. Places of worship during religious functions are not included.

2.8.5.1 **Adult care facility.** A facility that provides accommodations for less than 24 hours for more than five unrelated adults and provides supervision and personal care services shall be classified as Group I-4.

Exception: A facility where occupants are capable of responding to an emergency situation without physical assistance from the staff shall be classified as Group A-3.

2.8.5.2 **Child care facility.** A facility that provides supervision and personal care on less than a 24 hours basis for more than five children 21/2 years of age or less shall be classified as Group I-4.

Exception: A child day care facility that provides care for more than five but no more than 100 children 21/2 years or less of age, when the rooms where such children are cared for are located on the level of exit discharge and each of these child care rooms has an exit door directly to the exterior, shall be classified as Group E.

SECTION 2.9
MERCANTILE GROUP M

2.9.1 **Mercantile Group M.** Mercantile Group M occupancy includes, among others, buildings and structures or a portion thereof, for the display and sale of merchandise, and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public. Mercantile occupancies shall include, but not be limited to, the following:

Department stores
Drug stores
Markets
Motor fuel-dispensing facilities
Retail or wholesale stores
Sales rooms

2.9.2 **Quantity of hazardous materials.** The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored or displayed in a single control area of a Group M occupancy shall not exceed the quantities in Table 2.14.2.4.

SECTION 2.10
RESIDENTIAL GROUP R

2.10.1 **Residential Group R.** Residential Group R includes, among others, the use of a building or structure, or a portion thereof, for sleeping purposes when not classified as an Institutional Group I. Residential occupancies shall include the

following:
R-1 Residential occupancies where the occupants are primarily transient in nature, including:
Boarding houses (transient)
Hotels (transient)
Motels (transient)
R-2 Residential occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature, including:
Apartment houses
Boarding houses (not transient)
Dormitories
Fraternities and sororities
Vacation timeshare properties
Hotels (nontransient)
Motels (nontransient)
R-3 Residential occupancies where the occupants are primarily permanent in nature and not classified as R-1, R-2, R-4 or I and where buildings do not contain more than two dwelling units as applicable in SBC, or adult and child care facilities that provide accommodations for five or fewer persons of any age for less than 24 hours. Adult and child care facilities that are within a single-family home are permitted to comply with SBC.
R-4 Residential occupancies shall include buildings arranged for occupancy as residential care/assisted living facilities including more than five but not more than 16 occupants, excluding staff.
Group R-4 occupancies shall meet the requirements for construction as defined for Group R-3 except as otherwise provided for in this code requirements or in accordance with SBC.

2.10.2 **Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code requirements, have the meanings shown herein.

BOARDING HOUSE. A building arranged or used for lodging for compensation, with or without meals, and not occupied as a single-family unit.

DORMITORY. A space in a building where group sleeping accommodations are provided in one room, or in a series of closely associated rooms, for persons not members of the same family group, under joint occupancy and single management, as in college dormitories or fraternity houses.

DWELLING UNIT. A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

PERSONAL CARE SERVICE. The care of residents who do not require chronic or convalescent medical or nursing care. Personal care involves responsibility for the safety of the resident while inside the building.

RESIDENTIAL CARE/ASSISTED LIVING FACILITIES. A building or part thereof housing persons, on a 24 hours basis, who because of age, mental disability or other reasons, live in a supervised residential environment which provides personal care services. The occupants are capable of responding to an emergency situation without physical assistance from staff. This classification

shall include, but not be limited to, the following: residential board and care facilities, assisted living facilities, halfway houses, group homes, congregate care facilities, social rehabilitation facilities, alcohol and drug abuse treatment centers and convalescent facilities.

SECTION 2.11
STORAGE GROUP S

2.11.1 **Storage Group S.** Storage Group S occupancy includes, among others, the use of a building or structure, or a portion thereof, for storage that is not classified as a hazardous occupancy.

2.11.2 **Moderate-hazard storage, Group S-1.** Buildings occupied for storage uses which are not classified as Group S-2 including, but not limited to, storage of the following:

Aerosols, Levels 2 and 3
Aircraft repair hangar
Bags; cloth, burlap and paper
Bamboos and rattan
Baskets
Belting; canvas and leather
Books and paper in rolls or packs
Boots and shoes
Buttons, including cloth covered, pearl or bone
Cardboard and cardboard boxes
Clothing, woolen wearing apparel
Cordage
Furniture
Furs
Glues, mucilage, pastes and size
Grains
Horns and combs, other than celluloid
Leather
Linoleum
Lumber
Motor vehicle repair garages complying with the maximum allowable quantities of hazardous materials listed in Table 2.7.7(1) (see Section 2.6.6)
Photo engravings resilient flooring
Silks
Soaps
Sugar
Tires, bulk storage of
Tobacco, cigars, and cigarettes
Upholstery and mattresses
Wax candles

2.11.3 **Low-hazard storage, Group S-2.** Includes, among others, buildings used for the storage of noncombustible materials such as products on wood pallets or in paper cartons with or without single thickness divisions; or in paper wrappings. Such products are permitted to have a negligible amount of plastic trim, such as knobs, handles or film wrapping. Storage uses shall include, but not be limited to, storage of the following:

Aircraft hangar
Asbestos
Medical products up to and including 12-percent alcohol in metal, glass or ceramic containers
Cement in bags
Chalk and crayons
Dairy products in non-waxed coated paper containers
Dry cell batteries
Electrical coils
Electrical motors
Empty cans
Food products
Foods in noncombustible containers
Fresh fruits and vegetables in non-plastic trays or containers
Frozen foods
Glass
Glass bottles, empty or filled with noncombustible liquids
Gypsum board
Inert pigments
Ivory
Meats
Metal cabinets
Metal desks with plastic tops and trim
Metal parts
Metals
Mirrors
Oil-filled and other types of distribution transformers
Parking garages, open or enclosed
Porcelain and pottery
Stoves
Talc and soap stones
Washers and dryers

SECTION 2.12
UTILITY AND MISCELLANEOUS GROUP U

2.12.1 **General.** Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of the SBC commensurate with the fire and life hazard incidental to their occupancy. Group U shall include, but not be limited to, the following:

Agricultural buildings
Aircraft hangars, accessory to a one or two-family residence (see Section 2.12.3)
Barns
Carports
Fences more than 1.8 m high
Grain silos, accessory to a residential occupancy
Greenhouses
Livestock shelters
Private garages
Retaining walls
Sheds

Stables
Tanks
Towers

SECTION 2.13
SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

2.13.1 **Scope.** Detailed use and occupancy requirements. In addition to the occupancy and construction requirements in this code requirements, the provisions of these sections apply to the special uses and occupancies described herein.

SECTION 2.14
COVERED MALL BUILDINGS

2.14.1 **Scope.** The provisions of this section shall apply to buildings or structures defined herein as covered mall buildings not exceeding three floor levels at any point nor more than three stories above grade. Except as specifically required by this section, covered mall buildings shall meet applicable provisions of this code requirements.

Exceptions:

1. Foyers and lobbies of Groups B, R-1 and R-2 are not required to comply with this section.
2. Buildings need not comply with the provisions of this section where they totally comply with other applicable provisions of the code requirements.

2.14.2 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the meanings shown herein.

ANCHOR BUILDING. An exterior perimeter building of a group other than H having direct access to a covered mall building but having required means of egress independent of the mall.

COVERED MALL BUILDING. A single building enclosing a number of tenants and occupants such as retail stores, drinking and dining establishments, entertainment and amusement facilities, passenger transportation terminals, offices, and other similar uses wherein two or more tenants have a main entrance into one or more malls. For the purpose of this chapter, anchor buildings shall not be considered as a part of the covered mall building.

FOOD COURT. A public separate seating area for male/families located in the mall that serves adjacent food preparation tenant spaces.

GROSS LEASABLE AREA. The total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the centerlines of joint partitions to the outside of the tenant walls. All tenant areas, including areas used for storage, shall be included in calculating gross leasable area.

MALL. A roofed or covered common pedestrian area within a covered mall building that serves as access for two or more tenants and not to exceed three levels that are open to each other.

2.14.3 **Lease plan.** Each covered mall building owner shall provide both the building

authority and fire civil defense – with a lease plan showing the location of each occupancy and its exits after the certificate of occupancy has been issued. No modifications or changes in occupancy or use shall be made from that shown on the lease plan without prior approval of the building official.

2.14.4 **Means of egress.** Each tenant space and the covered mall building shall be provided with means of egress as required by this section and this code requirements. Where there is a conflict between the requirements of this code requirements and the requirements of this section, the requirements of this section shall apply.

2.14.4.1 **Determination of occupant load.** The occupant load permitted in any individual tenant space in a covered mall building shall be determined as required by this code requirements. Means of egress requirements for individual tenant spaces shall be based on the occupant load thus determined.

2.14.4.1.1 **Occupant formula.** In determining required means of egress of the mall, the number of occupants for whom means of egress are to be provided shall be based on gross leasable area of the covered mall building (excluding anchor buildings) and the occupant load factor as determined by the following equation.

$$OLF = ((0.00007)(GLA) + 25) \text{ X } 0.0929 \qquad \textbf{(Equation 4-1)}$$

Where:
OLF = The occupant load factor (square meters per person).
GLA = The gross leasable area (meters).

2.14.4.1.2 **OLF range.** The occupant load factor (*OLF*) is required to be less than 2.8 and shall not exceed 4.6.

2.14.4.1.3 **Anchor buildings.** The occupant load of anchor buildings opening into the mall shall not be included in computing the total number of occupants for the mall.

2.14.4.1.4 **Food courts.** The occupant load of a food court shall be determined in accordance with Section 8.3. For the purposes of determining the means of egress requirements for the mall, the food court occupant load shall be added to the occupant load of the covered mall building as calculated above.

2.14.4.2 **Number of means of egress.** Wherever the distance of travel to the mall from any location within a tenant space used by persons other than employees exceeds 23 m or the tenant space exceeds an occupant load of 50, not less than two means of egress shall be provided.

2.14.4.3 **Arrangements of means of egress.** Assembly occupancies with an occupant load of 500 or more shall be so located in the covered mall building that their entrance will be immediately adjacent to a principal entrance to the mall and shall have not less than one-half of their required means of egress opening directly to the exterior of the covered mall building.

2.14.4.3.1 **Anchor building means of egress.** Required means of egress for anchor buildings shall be provided independently from the mall means of egress system. The occupant load of anchor buildings opening into the mall shall not be included in determining means of egress requirements for the mall. The path of egress travel of malls shall not exit through anchor buildings. Malls terminating at an anchor building where no other means of egress has been provided shall be considered as a dead-end mall.

2.14.4.4 **Distance to exits.** Within each individual tenant space in a covered mall building, the maximum distance of travel from any point to an exit or entrance to the mall

shall not exceed 61 m.

The maximum distance of travel from any point within a mall to an exit shall not exceed 61 m.

2.14.4.5 **Access to exits.** Where more than one exit is required, they shall be so arranged that it is possible to travel in either direction from any point in a mall to separate exits. The minimum width of an exit passageway or corridor from a mall shall be 1.7 m.

Exception: Dead ends not exceeding a length equal to twice the width of the mall measured at the narrowest location within the dead-end portion of the mall.

2.14.4.5.1 **Exit passageway enclosures.** Where exit passageway enclosures provide a secondary means of egress from a tenant space, doors to the exit passageway enclosures shall be 1hour fire doors. Such doors shall be self-closing and be so maintained or shall be automatic-closing by smoke detection.

2.14.4.6 **Service areas fronting on exit passageways.** Mechanical rooms, electrical rooms, building service areas and service elevators are permitted to open directly into exit passageways provided that the exit passageway is separated from such rooms with 1 hour fire-resistance-rated walls and 1 hour opening protectives.

2.14.5 **Mall width.** For the purpose of providing required egress, malls are permitted to be considered as corridors but need not comply with the requirements of Section 8.5.1 of this code requirements where the width of the mall is as specified in this section.

2.14.5.1 **Minimum width.** The minimum width of the mall shall be 6.1 m. The mall width shall be sufficient to accommodate the occupant load served. There shall be a minimum of 3.1 m clear exit width to a height of 2.4 m between any projection of a tenant space bordering the mall and the nearest kiosk, vending machine, bench, display opening, food court or other obstruction to means of egress travel.

2.14.6 **Types of construction.** The area of any covered mall building, including anchor buildings, of Type I, II, III and IV construction, shall not be limited provided the covered mall building and attached anchor buildings and parking garages are surrounded on all sides by a permanent open space of not less than 18.3 m and the anchor buildings do not exceed three stories in height. The allowable height and area of anchor buildings greater than three stores in height shall comply with Section 3.3, as modified by Sections 3.4 and 3.6. The construction type of open parking garages and enclosed parking garages shall comply with Sections 2.6.3 and 2.6.4 respectively.

2.14.7 **Fire-resistance-rated separation.** Fire-resistance-rated separation is not required between tenant spaces and the mall. Fire-resistance-rated separation is not required between a food court and adjacent tenant spaces or the mall.

2.14.7.1 **Attached garage.** An attached garage for the storage of passenger vehicles having a capacity of not more than nine persons and open parking garages shall be considered as a separate building where it is separated from the covered mall building by a fire barrier having a fire-resistance rating of at least 2 hours.

Exception: Where an open parking garage or enclosed parking garage is separated from the covered mall building or anchor building a distance greater than 3.1 m, the provisions of Table 4A.2 of SBC 801 shall apply. Pedestrian walkways and tunnels which attach the open parking garage or enclosed parking garage to the covered mall building or anchor building shall be constructed in accordance with Section 4.4 of this code requirements.

2.14.7.2 **Tenant separations.** Each tenant space shall be separated from other tenant spaces

by a fire partition complying with Section 4B.8 of SBC 801 A tenant separation wall is not required between any tenant space and the mall.

2.14.7.3 **Anchor building separation.** An anchor building shall be separated from the covered mall building by fire walls complying with Section 4B.6 of SBC 801.

Exception: Anchor buildings of not more than three stories above grade which have an occupancy classification of the same uses permitted as tenants of the covered mall building shall be separated by 2 hours fire resistive fire- barriers complying with Section 4B.6 of SBC 801.

2.14.7.3.1 **Openings between anchor building and mall.** Except for the separation between Group R-1 sleeping units and the mall, openings between anchor buildings of Type IA, IB, IIA and IIB construction and the mall need not be protected.

2.14.8 **Automatic sprinkler system.** The covered mall building and buildings connected shall be provided throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1, which shall comply with the following:

1. The automatic sprinkler system shall be complete and operative throughout occupied space in the covered mall building prior to occupancy of any of the tenant spaces. Unoccupied tenant spaces shall be similarly protected unless provided with approved alternate protection.

2. Sprinkler protection for the mall shall be independent from that provided for tenant spaces or anchors. Where tenant spaces are supplied by the same system, they shall be independently controlled.

Exception: An automatic sprinkler system shall not be required in spaces or areas of open parking garages constructed in accordance with Section 2.6.2.

2.14.8.1 **Standpipe system.** The covered mall building shall be equipped throughout with a standpipe system as required by Section 7.5.3.3.

2.14.9 **Smoke control.** A smoke control system shall be provided where required for atriums in Section 2.4.

2.14.10 **Kiosks.** Kiosks and similar structures (temporary or permanent) shall meet the following requirements:

1. Combustible kiosks or other structures shall not be located within the mall unless constructed of any of the following materials:

1.1 Fire-retardant-treated wood complying with Section 11.14 of this code requirements.

1.2 Foam plastics having a maximum heat release rate not greater than 105 Btu/h when tested in accordance with the exhibit booth protocol in UL 1975.

1.3 Aluminum composite material (ACM) having a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E 84.

2. Kiosks or similar structures located within the mall shall be provided with approved fire suppression and detection devices.

3. The minimum horizontal separation between kiosks or groupings thereof and other structures within the mall shall be 6.1 m.

4. Each kiosk or similar structure or groupings thereof shall have a maximum area of 28 m^2.

2.14.11 **Security grilles and doors.** Horizontal sliding or vertical security grilles or doors that are a part of a required means of egress shall conform to the following:

1. They shall remain in the full open position during the period of occupancy by the general public.
2. Doors or grilles shall not be brought to the closed position when there are more than 10 persons occupying spaces served by a single exit or 50 persons occupying spaces served by more than one exit.
3. The doors or grilles shall be openable from within without the use of any special knowledge or effort where the space is occupied.
4. Where two or more exits are required, not more than one-half of the exits shall be permitted to include either a horizontal sliding or vertical rolling grille or doors.

2.14.12 **Standby power.** Covered mall buildings exceeding 4,645 m^2 shall be provided with standby power systems that are capable of operating the emergency voice/alarm communication system.

2.14.13 **Emergency voice/alarm communication system.** Covered mall buildings exceeding 4,645 m^2 in total floor area shall be provided with an emergency voice/alarm communication system. Emergency voice/alarm communication systems serving a mall required or otherwise, shall be accessible to the fire - civil defense. The system shall be provided in accordance with Section 7.7.2.12.2.

2.14.14 **Plastic signs.** Within every store or level and from sidewall to sidewall of each tenant space facing the mall, plastic signs shall be limited as specified in Sections 2.15.14.1 through 2.15.14.5.

2.14.14.1 **Area.** Plastic signs shall not exceed 20 percent of the wall area facing the mall.

2.14.14.2 **Height and width.** Plastic signs shall not exceed a height of 914 mm, except if the sign is vertical, the height shall not exceed 2438 mm and the width shall not exceed 914 mm.

2.14.14.3 **Location.** Plastic signs shall be located a minimum distance of 457 mm from adjacent tenants.

2.14.14.4 **Plastics other than foam plastics.** Plastics other than foam plastics used in signs shall be light-transmitting plastics complying with Section 11.6.4 of this code requirements or shall have a self-ignition temperature of 343°C or greater when tested in accordance with ASTM D 1929, and a flame spread index not greater than 75 and smoke-developed index not greater than 450 when tested in the manner intended for use in accordance with ASTM E 84 or meet the acceptance criteria of Section 6.3.2.1 when tested in accordance with NFPA 286.

2.14.14.4.1 **Encasement.** Edges and backs of plastic signs in the mall shall be fully encased in metal.

2.14.14.5 **Foam plastics.** Foam plastics used in signs shall have flame-retardant characteristics such that the sign has a maximum heat-release rate of 150 kilowatts when tested in accordance with UL 1975 and the foam plastics shall have the physical characteristics specified in this section. Foam plastics used in signs installed in accordance with Section 22.14 shall not be required to comply with the flame spread and smoke-developed indexes specified in Section 11.3.3.

2.14.14.5.1 **Density.** The minimum density of foam plastics used in signs shall not be less than (320 kg/m^3).

2.14.14.5.2 **Thickness.** The thickness of foam plastic signs shall not be greater than 12.7 mm.

2.14.15 **Civil defense access to equipment.** Rooms or areas containing controls for air-conditioning systems, automatic fire-extinguishing systems or other detection, suppression or control elements shall be identified for use by the fire – civil defense.

SECTION 2.15
HIGH-RISE BUILDINGS

2.15.1 **Applicability.** The provisions of this section shall apply to buildings having occupied floors located more than 23 m above the lowest level of fire department vehicle access.

Exception: The provisions of this section shall not apply to the following buildings and structures:

1. Airport traffic control towers in accordance with Section 2.12.
2. Open parking garages in accordance with Section 2.6.3.
3. Buildings with an occupancy in Group A-5 in accordance with Section 23.1.
4. Low-hazard special industrial occupancies in accordance with Section 3.3.1.2.
5. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 2.15.

2.15.2 **Automatic sprinkler system.** Buildings and structures shall be equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1 and a secondary water supply where required by Section 7.3.3.5.2.

Exception: An automatic sprinkler system shall not be required in spaces or areas of:

1. Open parking garages in accordance with Section 2.6.3.
2. Telecommunications equipment buildings used exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines, provided that those spaces or areas are equipped throughout with an automatic fire detection system in accordance with Section 7.7.2 and are separated from the remainder of the building with fire barriers consisting of 1hour fire-resistance-rated walls and 2 hours fire-resistance-rated floor/ceiling assemblies.

2.15.3 **Reduction in fire-resistance rating.** The fire-resistance-rating reductions listed in Sections 2.15.3.1 and 2.15.3.2 shall be allowed in buildings that have sprinkler control valves equipped with supervisory initiating devices and water-flow initiating devices for each floor.

2.15.3.1 **Type of construction.** The following reductions in the minimum construction type allowed in Table 4A.1 shall be allowed as provided in Section 2.15.3:

1. Type IA construction shall be allowed to be reduced to Type IB.
2. In other than Groups F-1, M and S-1, Type IB construction shall be allowed to be reduced to Type IIA.
3. The height and area limitations of the reduced construction type shall be allowed to be the same as for the original construction type.

2.15.3.2 **Shaft enclosures.** The required fire-resistance rating of the fire barrier walls enclosing vertical shafts, other than exit enclosures and elevator hoistway enclosures, shall be reduced to 1 hour where automatic sprinklers are installed within the shafts at the top and at alternate floor levels.

2.15.4 **Emergency escape and rescue.** Emergency escape and rescue openings required by Section 8.25 are not required.

2.15.5 **Automatic fire detection.** Smoke detection shall be provided in accordance with Section 7.7.2.12.1.

2.15.6 **Emergency voice/alarm communication systems.** An emergency voice/alarm communication system shall be provided in accordance with Section 7.7.2.12.2.

2.15.7 **Fire civil defense communications system.** A two-way civil defense communications system shall be provided for fire department use in accordance with Section 7.7.2.12.3.

2.15.8 **Fire command.** A fire command center complying with Section 7.11 shall be provided in a location approved by the fire department.

2.15.9 **Elevators.** Elevator operation and installation shall be in accordance with SBC 501.

2.15.10 **Standby power.** A standby power system complying with SBC 401 shall be provided for standby power loads specified in Section 2.15.10.2.

2.15.10.1 **Special requirements for standby power systems.** If the standby system is a generator set inside a building, the system shall be located in a separate room enclosed with 2 hours fire-resistance-rated fire barrier assemblies. System supervision with manual start and transfer features shall be provided at the fire command center.

2.15.10.2 **Standby power loads.** The following are classified as standby power loads:

1. Power and lighting for the fire command center required by Section 2.15.8;
2. Electrically powered fire pumps;
3. Ventilation and automatic fire detection equipment for smokeproof enclosures.

Standby power shall be provided for elevators in accordance with SBC 501.

2.15.11 **Emergency power systems.** An emergency power system complying with SBC 401 shall be provided for emergency power loads specified in Section 2.16.11.1.

2.15.11.1 **Emergency power loads.** The following are classified as emergency power loads:

1. Exit signs and means of egress illumination required by Chapter 8;
2. Elevator car lighting;
3. Emergency voice/alarm communications systems;
4. Automatic fire detection systems; and
5. Fire alarm systems.

2.15.12 **Stairway door operation.** Stairway doors other than the exit discharge doors shall be permitted to be locked from stairway side. Stairway doors that are locked from the stairway side shall be capable of being unlocked simultaneously without unlatching upon a signal from the fire command center.

2.15.12.1 **Stairway communications system.** A telephone or other two-way communications system connected to an approved constantly attended station shall be provided at not less than every fifth floor in each required stairway where the doors to the stairway are locked.

2.15.13 **Smokeproof exit enclosures.** Every required stairway serving floors more than 23 m above the lowest level of civil defense vehicle access shall comply with Sections 7.9.20 and 8.19.1.8.

2.15.14 **Seismic considerations.** For seismic considerations, see SBC 301.

SECTION 2.16
ATRIUMS

2.16.1 **General.** Vertical openings meeting the requirements of this section are not required to be enclosed in other than Group H occupancies.

2.16.1.1 **Definition**. The following word and term shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the meaning shown herein.

ATRIUM. An opening connecting two or more stories other than enclosed stairways, elevators, hoistways, escalators, plumbing, electrical, air-conditioning or other equipment, which is closed at the top and not defined as a mall. Stories, as used in this definition, do not include balconies within assembly groups or mezzanines that comply with Section 3.5.

2.16.2 **Use.** The floor of the atrium shall not be used for other than low fire hazard uses and only approved materials and decorations in accordance with this code requirements shall be used in the atrium space.
Exception: The atrium floor area is permitted to be used for any approved use where the individual space is provided with an automatic sprinkler system in accordance with Section 7.3.3.1.1.

2.16.3 **Automatic sprinkler protection.** An approved automatic sprinkler system shall be installed throughout the entire building.
Exceptions:
1. That area of a building adjacent to or above the atrium need not be sprinklered provided that portion of the building is separated from the atrium portion by a 2 hours fire barrier wall or horizontal assembly or both.
2. Where the ceiling of the atrium is more than 17 m above the floor, sprinkler protection at the ceiling of the atrium is not required.

2.16.4 **Smoke control.** A smoke control system shall be installed in accordance with Section 7.9.
Exceptions:
1. Smoke control is not required for floor openings meeting the requirements of Section 4B.7 of SBC 801, Exception 2, 7, 8 or 9.
2. Smoke control is not required for floor openings meeting the requirements of Section 8.19.1, Exception 8 or 9.

2.16.5 **Enclosure of atriums.** Atrium spaces shall be separated from adjacent spaces by a 1 hour fire barrier wall.
Exceptions:
1. A glass wall forming a smoke partition where automatic sprinklers are spaced 1.8 m or less along both sides of the separation wall, or on the room side only if there is not a walkway on the atrium side, and between 102 mm and 305 mm away from the glass and so designed that the entire surface of the glass is wet upon activation of the sprinkler system. The glass shall be installed in a gasketed frame so that the framing system deflects without breaking (loading) the glass before the sprinkler system operates.
2. A glass-block wall assembly in accordance with SBC 305 and having a $^3/_4$ hour fire protection rating.
3. The adjacent spaces of any three floors of the atrium shall not be required to be separated from the atrium where such spaces are included in computing the atrium volume for the design of the smoke control system.

2.16.6 **Standby power.** Equipment required to provide smoke control shall be connected to a standby power system in accordance with Section 7.9.11.

2.16.7 **Interior finish.** The interior finish of walls and ceilings of the atrium shall not be less than Class B with no reduction in class for sprinkler protection.

2.16.8 **Travel distance.** In other than the lowest level of the atrium, where the required means of egress is through the atrium space, the portion of exit access travel distance within the atrium space shall not exceed 61 m.

SECTION 2.17
UNDERGROUND BUILDINGS

2.17.1 **General.** The provisions of this section apply to building spaces having a floor level used for human occupancy more than 9.1 m below the lowest level of exit discharge.

Exceptions:

1. One- and two-family dwellings, sprinklered in accordance with Section 7.3.3.1.3.
2. Parking garages with automatic fire suppression systems in compliance with Section 2.17.3.
3. Fixed guideway transit systems.
4. Grandstands, bleachers, stadiums, arenas and similar facilities.
5. Where the lowest story is the only story that would qualify the building as an underground building and has an area not exceeding 139 m^2 and has an occupant load less than 10.

2.17.2 **Construction requirements.** The underground portion of the building shall be of Type I construction.

2.17.3 **Automatic sprinkler system.** The highest level of exit discharge serving the underground portions of the building and all levels below shall be equipped with an automatic sprinkler system installed in accordance with Section 7.3.3.1.1. Water-flow switches and control valves shall be supervised in accordance with Section 7.3.4.

2.17.4 **Compartmentation.** Compartmentation shall be in accordance with Sections 2.17.4.1 through 2.17.4.3.

2.17.4.1 **Number of compartments.** A building having a floor level more than 18.3 m below the lowest level of exit discharge shall be divided into a minimum of two compartments of approximately equal size. Such compartmentation shall extend through the highest level of exit discharge serving the underground portions of the building and all levels below.

Exception: The lowest story need not be compartmented where the area does not exceed 139 m^2 and has an occupant load of less than 10.

2.17.4.2 **Smoke barrier penetration.** The separation between the two compartments shall be of minimum 1hour fire barrier wall construction that shall extend from floor slab to floor deck above. Openings between the two compartments shall be limited to plumbing and electrical piping and conduit penetrations firestopped in accordance with Section 4B.12. Doorways shall be protected by door assemblies that are automatic-closing by smoke detection in accordance with Section 4B.15.3

of SBC 801 and shall be provided with gasketing and a drop sill to minimize smoke leakage. Where provided, each compartment shall have an air supply and an exhaust system independent of the other compartments.

2.17.4.3 **Elevators.** Where elevators are provided, each compartment shall have direct access to an elevator. Where an elevator serves more than one compartment, an elevator lobby shall be provided and shall be separated from each compartment by a 1 hour fire barrier wall. Doors shall be gasketed, have a drop sill, and be automatic-closing by smoke detection installed in accordance with Section 7.7.10.

2.17.5 **Smoke control system.** A smoke control system shall be provided in accordance with Sections 2.17.5.1 and 2.17.5.2.

2.17.5.1 **Control system.** A smoke control system is required to control the migration of products of combustion in accordance with Section 7.9 and the provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain means of egress in a usable condition.

2.17.5.2 **Smoke exhaust system.** Where compartmentation is required, each compartment shall have an independent smoke control system. The system shall be automatically activated and capable of manual operation in accordance with Section 7.7.2.18.

2.17.6 **Fire alarm systems.** A fire alarm system shall be provided where required by Section 7.7.2.19.

2.17.7 **Public address.** A public address system shall be provided where required by Section 7.7.2.19.1.

2.17.8 **Means of egress.** Means of egress shall be in accordance with Sections 2.18.8.1 and 2.18.8.2.

2.17.8.1 **Number of exits.** Each floor level shall be provided with a minimum of two exits. Where compartmentation is required by Section 2.17.4, each compartment shall have a minimum of one exit and shall also have an exit access doorway into the adjoining compartment.

2.17.8.2 **Smokeproof enclosure.** Every required stairway serving floor levels more than 9.1 m below its level of exit discharge shall comply with the requirements for a smokeproof enclosure as provided in Section 8.19.1.8.

2.17.9 **Standby power.** A standby power system complying with SBC 401 shall be provided standby power loads specified in Section 2.17.9.1.

2.17.9.1 **Standby power loads.** The following loads are classified as standby power loads.

1. Smoke control system.
2. Ventilation and automatic fire detection equipment for smokeproof enclosures.
3. Fire pumps.

Standby power shall be provided for elevators in accordance with SBC 501.

2.17.9.2 **Pick-up time**. The standby power system shall pick up its connected loads within 60 seconds of failure of the normal power supply.

2.17.10 **Emergency power.** An emergency power system complying with SBC 401 shall be provided for emergency power loads specified in Section 2.17.10.1.

2.17.10.1 **Emergency power loads.** The following loads are classified as emergency power loads:

1. Emergency voice/alarm communications systems.
2. Fire alarm systems.

3. Automatic fire detection systems.
4. Elevator car lighting.
5. Means of egress and exit sign illumination as required by Chapter 8.

2.17.11 **Standpipe system.** The underground building shall be provided throughout with a standpipe system in accordance with Section 7.5.

SECTION 2.18
MOTOR-VEHICLE-RELATED OCCUPANCIES

2.18.1 **Private garages and carports.**

2.18.1.1 **Classification.** Buildings or parts of buildings classified as Group U occupancies because of the use or character of the occupancy shall not exceed 93 m^2 in area or one story in height except as provided in Section 2.18.1.2. Any building or portion thereof that exceeds the limitations specified in this section shall be classified in the occupancy group other than Group U that it most nearly resembles.

2.18.1.2 **Area increase.** Group U occupancies used for the storage of private or pleasure-type motor vehicles where no repair work is done or fuel dispensed are permitted to be 279 m^2, when the following provisions are met:

1. For a mixed occupancy building, the exterior wall and opening protection for the Group U portion of the building shall be as required for the major occupancy of the building. For such mixed occupancy building, the allowable floor area of the building shall be as permitted for the major occupancy contained therein.
2. For a building containing only Group U occupancy, the exterior wall and opening protection shall be as required for a Group R-1 or R-2 occupancy.

More than one 279 m^2 Group U occupancy shall be permitted to be in the same building, provided each 279 m^2 area is separated by fire walls complying with Section 4B.6.

2.18.1.3 **Garages and carports.** Carports shall be open on at least two sides. Carport floor surfaces shall be of approved noncombustible material. Carports not open on at least two sides shall be considered a garage and shall comply with the provisions of this section for garages.

Exception: Asphalt surfaces shall be permitted at ground level in carports.

The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

2.18.1.4 **Separation.** Separations shall comply with the following:

1. The private garage shall be separated from the dwelling unit and its attic area by means of a minimum 12.7 mm gypsum board applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than 16 mm Type X gypsum board or equivalent. Door openings between a private garage and the dwelling unit shall be equipped with either solid wood doors, or solid or honeycomb core steel doors not less than 35 m thick, or doors in compliance with Section 4B.15.3.3 of SBC 801. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted.
2. Ducts in a private garage and ducts penetrating the walls or ceilings separating the dwelling unit from the garage shall be constructed of a minimum 0.48 mm sheet steel and shall have no openings into the garage.
3. A separation is not required between a Group R-3 and U carport provided the carport is entirely open on two or more sides and there are not enclosed areas

above.

2.18.2 Parking garages.

2.18.2.1 **Classification.** Parking garages shall be classified as open, as defined in Section 2.18.3, or enclosed and shall meet the appropriate criteria in Section 2.18.4. Also see Section 3.8 for special provisions for parking garages.

2.18.2.2 **Clear height.** The clear height of each floor level in vehicle and pedestrian traffic areas shall not be less than 2.1 m. Vehicle and pedestrian areas accommodating van-accessible parking required by Section 9.6.5 of the this code requirements shall conform to ICC/ANSI A117.1.

2.18.2.3 **Guards.** Guards shall be provided in accordance with Section 8.12 at exterior and interior vertical openings on floor and roof areas where vehicles are parked or moved and where the vertical distance to the ground or surface directly below exceeds 762 mm.

2.18.2.4 **Vehicle barriers.** Parking areas shall be provided with exterior or interior walls or vehicle barriers, except at pedestrian or vehicular accesses, designed in accordance with SBC 301. Vehicle barriers not less than 607 mm high shall be placed at the ends of drive lanes, at the end of parking spaces where the difference in adjacent floor elevation is greater than 305 mm.

2.18.2.5 **Ramps.** Vehicle ramps shall not serve as an exit element.

2.18.2.6 **Floor surface.** Parking surfaces shall be of concrete or similar noncombustible and nonabsorbent materials.

Exception: Asphalt parking surfaces are permitted at ground level.

The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

2.18.2.7 **Mixed separation.** Parking garages shall be separated from other occupancies in accordance with Section 2.2.1.1.

2.18.2.8 **Special hazards.** Connection of a parking garage with any room in which there is a fuel-fired appliance shall be by means of a vestibule providing a two-doorway separation.

Exception: A single door shall be allowed provided the sources of ignition in the appliance are at least 457 mm above the floor.

2.18.2.9 **Attached to rooms.** Openings from a parking garage directly into a room used for sleeping purposes shall not be permitted.

2.18.3 Open parking garages.

2.18.3.1 **Scope.** Except where specific provisions are made in the following subsections, other requirements of this code requirements shall apply.

2.18.3.2 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the meanings shown herein.

MECHANICAL-ACCESS OPEN PARKING GARAGES. Open parking garages employing parking machines, lifts, elevators or other mechanical devices for vehicles moving from and to street level and in which public occupancy is prohibited above the street level.

OPEN PARKING GARAGE. A structure or portion of a structure with the openings as described in Section 2.19.3.3.1 on two or more sides that is used for the parking or storage of private motor vehicles as described in Section 2.19.3.4.

RAMP-ACCESS OPEN PARKING GARAGES. Open parking garages employing a series of continuously rising floors or a series of interconnecting ramps between floors permitting the movement of vehicles under their own power from and to the street level.

2.18.3.3 **Construction.** Open parking garages shall be of Type I, II or IV construction. Open parking garages shall meet the design requirements of SBC 301. For vehicle barriers, see Section 2.18.2.4.

2.18.3.3.1 **Openings.** For natural ventilation purposes, the exterior side of the structure shall have uniformly distributed openings on two or more sides. The area of such openings in exterior walls on a tier must be at least 20 percent of the total perimeter wall area of each tier. The aggregate length of the openings considered to be providing natural ventilation shall constitute a minimum of 40 percent of the perimeter of the tier. Interior walls shall be at least 20 percent open with uniformly distributed openings.

Exception: Openings are not required to be distributed over 40 percent of the building perimeter where the required openings are uniformly distributed over two opposing sides of the building.

2.18.3.4 **Uses.** Mixed uses shall be allowed in the same building as an open parking garage subject to the provisions of Sections 2.14.3, 2.14.7.1, 2.18.3.13, 3.8.3, 3.8.5 and 3.8.8

2.18.3.5 **Area and height.** Area and height of open parking garages shall be limited as set forth in Chapter 3 for Group S-2 occupancies and as further provided for in Section 2.2.3.

2.18.3.5.1 **Single use.** When the open parking garage is used exclusively for the parking or storage of private motor vehicles, with no other uses in the building, the area and height shall be permitted to comply with Table 2.18.3.5, along with increases allowed by Section 2.18.3.6.

Exception: The grade-level tier is permitted to contain an office, waiting and toilet rooms having a total combined area of not more than 93 m^2. Such area need not be separated from the open parking garage.

In open parking garages having a spiral or sloping floor, the horizontal projection of the structure at any cross section shall not exceed the allowable area per parking tier. In the case of an open parking garage having a continuous spiral floor, each 2.9 m of height, or portion thereof, shall be considered a tier.

The clear height of a parking tier shall not be less than 2.1 m, except that a lower clear height is permitted in mechanical-access open parking garages where approved by the building official.

TABLE 2.18.3.5
OPEN PARKING GARAGES AREA AND HEIGHT

TYPE OF CONSTRUCTION	AREA PER TIER (square meters)	HEIGHT (in tiers)		
			Mechanical access	
			Automatic sprinkler system	
		Ramp access	No	Yes
IA	Unlimited	Unlimited	Unlimited	Unlimited
IB	Unlimited	12 tiers	12 tiers	18 tiers
IIA	4,645	10 tiers	10 tiers	15 tiers
IIB	4,645	8 tiers	8 tiers	12 tiers
IV	4,645	4 tiers	4 tiers	4 tiers

2.19.3.6 **Area and height increases.** The allowable area and height of open parking garages shall be increased in accordance with the provisions of this section. Garages with sides open on three-fourths of the building perimeter are permitted to be increased by 25 percent in area and one tier in height. Garages with sides open around the entire building perimeter are permitted to be increased 50 percent in area and one tier in height. For a side to be considered open under the above provisions, the total area of openings along the side shall not be less than 50 percent of the interior area of the side at each tier, and such openings shall be equally distributed along the length of the tier.

Allowable tier areas in Table 2.18.3.5 shall be increased for open parking garages constructed to heights less than the table maximum. The gross tier area of the garage shall not exceed that permitted for the higher structure. At least three sides of each such larger tier shall have continuous horizontal openings not less than 762 mm in clear height extending for at least 80 percent of the length of the sides, and no part of such larger tier shall be more than 61 m horizontally from such an opening. In addition, each such opening shall face a street or yard accessible to a street with a width of at least 9.1 m for the full length of the opening, and standpipes shall be provided in each such tier.

Open parking garages of Type IB and II construction, with all sides open, shall be unlimited in allowable area where the height does not exceed 23 m. For a side to be considered open, the total area of openings along the side shall not be less than 50 percent of the interior area of the side at each tier, and such openings shall be equally distributed along the length of the tier. All portions of tiers shall be within 61 m horizontally from such openings.

2.18.3.7 **Location on property.** Exterior walls and openings in exterior walls shall comply with Tables 4A.1 and 4A.2. The distance from an adjacent property line shall be determined in accordance with Table 4A.2 of SBC 801 and Section 4B.4.

2.18.3.8 **Means of egress.** Where persons other than parking attendants are permitted, open parking garages shall meet the means of egress requirements of Chapter 8. Where no persons other than parking attendants are permitted, there shall not be less than two 914 mm exit stairways. Lifts shall be permitted to be installed for use of employees only, provided they are completely enclosed by noncombustible materials.

2.18.3.9 **Standpipes.** Standpipes shall be installed where required by the provisions of Chapter 7 of the SBC 801.

2.18.3.10 **Sprinkler systems.** Where required by other provisions or this code requirements, automatic sprinkler systems and standpipes shall be installed in accordance with the provisions of Chapter 7 of the SBC 801.

2.18.3.11 **Enclosure of vertical openings.** Enclosure shall not be required for vertical openings except as specified in Section 2.18.3.8.

2.18.3.12 **Ventilation.** Ventilation, other than the percentage of openings specified in Section 2.18.3.3.1, shall not be required.

2.18.3.13 **Prohibitions.** The following uses and alterations are not permitted:

1. Vehicle repair work.
2. Parking of buses, trucks and similar vehicles.
3. Partial or complete closing of required openings in exterior walls by tarpaulins or any other means.
4. Dispensing of fuel.

2.18.4 **Enclosed parking garages.** Enclosed vehicle parking garages and portions thereof that do not meet the definition of open parking garages shall be limited to the allowable heights and areas specified in Table 3.3. Roof parking is permitted.

2.18.4.2 **Ventilation.** A mechanical ventilation system shall be provided in accordance with the SBC 501.

2.18.5 **Motor fuel-dispensing facilities.**

2.18.5.1 **Construction.** Motor fuel-dispensing facilities shall be constructed in accordance with this code requirements and this section.

2.18.5.2 **Canopies.** Canopies under which fuels are dispensed shall have a clear, unobstructed height of not less than 4.1 m to the lowest projecting element in the vehicle drive-through area. Canopies and their supports over pumps shall be of non-combustible materials, fire-retardant-treated wood complying with Chapter 4, wood of Type IV sizes or of construction providing 1hour fire resistance. Combustible materials used in or on a canopy shall comply with one of the following:

1. Shielded from the pumps by a noncombustible element of the canopy, or wood of Type IV sizes;
2. Plastics covered by aluminum facing having a minimum thickness of 0.30 mm or corrosion-resistant steel having a minimum base metal thickness of 0.41 mm. The plastic shall have a flame spread index of 25 or less and a smoke-developed index of 450 or less when tested in the form intended for use in accordance with ASTM E 84 and a self-ignition temperature of 343°C or greater when tested in accordance with ASTM D 1929; or
3. Panels constructed of light-transmitting plastic materials shall be permitted to be installed in canopies erected over motor vehicle fuel-dispensing station fuel dispensers, provided the panels are located at least 3.1 m from any building on the same property and face yards or streets not less than 12.2 m in width on the other sides. The aggregate areas of plastics shall not exceed 93 m^2. The maximum area of any individual panel shall not exceed 9.3 m^2.

2.18.6 **Repair garages.**

2.18.6.1 **General.** Repair garages shall be constructed in accordance with this code requirements and this section. This occupancy shall not include motor fuel-dispensing facilities, as regulated in Section 2.18.5.

2.18.6.2 **Mixed uses.** Mixed uses shall be allowed in the same building as a repair garage subject to the provisions of Section 2.2.3.

2.18.6.3 **Ventilation.** Repair garages shall be mechanically ventilated in accordance with the SBC 501. The ventilation system shall be controlled at the entrance to the garage.

2.18.6.4 **Floor surface.** Repair garage floors shall be of concrete or similar noncombustible and nonabsorbent materials.

Exception: Slip-resistant, nonabsorbent, interior floor finishes having a critical radiant flux not more than 0.45 W/cm^2, as determined by NFPA 253, shall be permitted.

2.18.6.5 **Heating equipment.** Heating equipment shall be installed in accordance with the SBC 501.

2.18.6.6 **Gas detection system.** Repair garages used for repair of vehicles fueled by non-odorized gases, such as hydrogen and non-odorized LNG, shall be provided with an approved flammable gas-detection system.

2.18.6.6.1 **System design.** The flammable gas-detection system shall be calibrated to the types of fuels or gases used by vehicles to be repaired. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower explosive limit. Gas detection shall also be provided in lubrication or chassis repair pits of garages used for repairing non-odorized LNG-fueled

vehicles.

2.18.6.6.2 **Operation.** Activation of the gas detection system shall result in all of the following:

1. Initiation of distinct audible and visual alarm signals in the repair garage.
2. Deactivation of all heating systems located in the repair garage.
3. Activation of the mechanical ventilation system, where the system is interlocked with gas detection.

2.18.6.6.3 **Failure of the gas detection system.** Failure of the gas detection system shall result in the deactivation of the heating system, activation of the mechanical ventilation system when the system is interlocked with the gas detection system and cause a trouble signal to sound in an approved location.

SECTION 2.19
GROUP I-2

2.19.1 **General.** Occupancies in Group I-2 shall comply with the provisions of this section and other applicable provisions of this code requirements.

2.19.2 **Corridors.** Corridors in occupancies in Group I-2 shall be continuous to the exits and separated from other areas in accordance with Section 2.20.3 except spaces conforming to Sections 2.19.2.1 through 2.19.2.4.

2.19.2.1 **Spaces of unlimited area.** Waiting areas and similar spaces constructed as required for corridors shall be permitted to be open to a corridor, only where all of the following criteria are met:

1. The spaces are not occupied for patient sleeping units, treatment rooms, hazardous or incidental use areas as defined in Section 2.2.1.1.
2. The open space is protected by an automatic fire detection system installed in accordance with Section 7.7.
3. The corridors onto which the spaces open, in the same smoke compartment, are protected by an automatic fire detection system installed in accordance with Section 7.7, or the smoke compartment in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 7.3.3.2.
4. The space is arranged so as not to obstruct access to the required exits.

2.19.2.2 **Nurses' stations.** Spaces for doctors' and nurses' charting, communications and related clerical areas shall be permitted to be open to the corridor, when such spaces are constructed as required for corridors.

2.19.2.3 **Mental health treatment areas.** Areas wherein mental health patients who are not capable of self-preservation are housed, or group meeting or multipurpose therapeutic spaces other than incidental use areas as defined in Section 2.2.1.1, under continuous supervision by facility staff, shall be permitted to be open to the corridor, where the following criteria are met:

1. Each area does not exceed 140 m^2.
2. The area is located to permit supervision by the facility staff.
3. The area is arranged so as not to obstruct any access to the required exits.
4. The area is equipped with an automatic fire detection system installed in accordance with Section 7.7.2.
5. Not more than one such space is permitted in any one smoke compartment.
6. The walls and ceilings of the space are constructed as required for corridors.

2.19.2.4 **Gift shops.** Gift shops less than 46.5 m^2 in area shall be permitted to be open to the corridor provided the gift shop and storage areas are fully sprinklered and

storage areas are protected in accordance with Section 2.2.1.1.

2.19.3 **Corridor walls.** Corridor walls shall be constructed as smoke partitions.

2.19.3.1 **Corridor doors.** Corridor doors, other than those in a wall required to be rated by Section 2.2.1.1 or for the enclosure of a vertical opening or an exit, shall not have a required fire protection rating and shall not be required to be equipped with self-closing or automatic-closing devices, but shall provide an effective barrier to limit the transfer of smoke and shall be equipped with positive latching. Roller latches are not permitted. Other doors shall conform to Section 4B.15.3 of SBC 801.

2.19.3.2 **Locking devices.** Locking devices that restrict access to the patient room from the corridor, and that are operable only by staff from the corridor side, shall not restrict the means of egress from the patient room except for patient rooms in mental health facilities.

2.19.4 **Smoke barriers.** Smoke barriers shall be provided to subdivide every story used by patients for sleeping or treatment and to divide other stories with an occupant load of 50 or more persons, into at least two smoke compartments. Such stories shall be divided into smoke compartments with an area of not more than 2,092 m^2 and the travel distance from any point in a smoke compartment to a smoke barrier door shall not exceed 61 m. The smoke barrier shall be in accordance with Section 4B.9.

2.19.4.1 **Refuge area.** At least 2.8 m^2 per patient shall be provided within the aggregate area of corridors, patient rooms, treatment rooms, lounge or dining areas and other low-hazard areas on each side of each smoke barrier. On floors not housing patients confined to a bed or litter, at least 0.56 m^2 per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining smoke compartments.

2.19.4.2 **Independent egress.** A means of egress shall be provided from each smoke compartment created by smoke barriers without having to return through the smoke compartment from which means of egress originated.

2.19.5 **Automatic sprinkler system.** Smoke compartments containing patient sleeping units shall be equipped throughout with an automatic fire sprinkler system in accordance with Section 7.3.3.1.1. The smoke compartments shall be equipped with approved quick-response or residential sprinklers in accordance with Section 7.3.3.2.

2.19.6 **Automatic fire detection.** Corridors in nursing homes (both intermediate-care and skilled nursing facilities), detoxification facilities and spaces permitted to be open to corridors by Section 2.19.2 shall be protected by an automatic fire detection system installed in accordance with Section 7.7.

Exceptions:

1. Corridor smoke detection is not required where patient sleeping units are provided with smoke detectors that comply with UL 268. Such detectors shall provide a visual display on the corridor side of each patient sleeping unit and an audible and visual alarm at the nursing station attending each unit.

2. Corridor smoke detection is not required where patient sleeping unit doors are equipped with automatic door-closing devices with integral smoke detectors on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

2.19.7 **Secured yards.** Grounds are permitted to be fenced and gates therein are permitted to be equipped with locks, provided that safe dispersal areas having 2.8 m^2 for bed and litter patients and 0.56 m^2 for ambulatory patients and other occupants are located between the building and the fence. Such provided safe dispersal areas shall not be located less than 15.3 m from the building they serve.

SECTION 2.20
GROUP I-3

2.20.1 **General.** Occupancies in Group I-3 shall comply with the provisions of this section and other applicable provisions of this code requirements (see Section 2.20.4).

2.20.2 **Mixed occupancies.** Portions of buildings with an occupancy in Group I-3 that are classified as a different occupancy shall meet the applicable requirements of this code requirements for such occupancies. Where security operations necessitate the locking of required means of egress, provisions shall be made for the release of occupants at all times.

Means of egress from detention and correctional occupancies that traverse other use areas shall, as a minimum, conform to requirements for detention and correctional occupancies.

Exception: It is permissible to exit through a horizontal exit into other contiguous occupancies that do not conform to detention and correctional occupancy egress provisions but that do comply with requirements set forth in the appropriate occupancy, as long as the occupancy is not a high-hazard use.

2.20.3 **Means of egress.** Except as modified or as provided for in this section, the provisions of Chapter 8 shall apply.

2.20.3.1 **Door width.** Doors to resident sleeping units shall have a clear width of not less than 711 mm.

2.20.3.2 **Sliding doors.** Where doors in a means of egress are of the horizontal-sliding type, the force to slide the door to its fully open position shall not exceed 220 N with a perpendicular force against the door of 220 N.

2.20.3.3 **Spiral stairs.** Spiral stairs that conform to the requirements of Section 8.3.3.3.9 are permitted for access to and between staff locations.

2.20.3.4 **Exit discharge.** Exits are permitted to discharge into a fenced or walled courtyard. Enclosed yards or courts shall be of a size to accommodate all occupants, a minimum of 15.3 m from the building with a net area of 1.4 m^2 per person.

2.20.3.5 **Sallyports.** A sallyport shall be permitted in a means of egress where there are provisions for continuous and unobstructed passage through the sallyport during an emergency egress condition.

2.20.3.6 **Vertical exit enclosures.** One of the required vertical exit enclosures in each building shall be permitted to have glazing installed in doors and interior walls at each landing level providing access to the enclosure, provided that the following conditions are met:

1. The vertical exit enclosure shall not serve more than four floor levels.
2. Vertical exit enclosure doors shall not be less than 3/4 hour fire doors complying with Section 4B.14.2 of SBC 801.
3. The total area of glazing at each floor level shall not exceed 3.23 m^2 and individual panels of glazing shall not exceed 0.84 m^2.
4. The glazing shall be protected on both sides by an automatic fire sprinkler system. The sprinkler system shall be designed to wet completely the entire

surface of any glazing affected by fire when actuated.

5. The glazing shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.
6. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the automatic sprinklers and the glazing.

2.20.4 **Locks.** Egress doors are permitted to be locked in accordance with the applicable use condition. Doors from an area of refuge to the exterior are permitted to be locked with a key in lieu of locking methods described in Section 2.20.4.1. The keys to unlock the exterior doors shall be available at all times and the locks shall be operable from both sides of the door.

2.20.4.1 **Remote release.** Remote release of locks on doors in a means of egress shall be provided with reliable means of operation, remote from the resident living areas, to release locks on all required doors. In Occupancy Conditions 3 or 4, the arrangement, accessibility and security of the release mechanism(s) required for egress shall be such that with the minimum available staff at any time, the lock mechanisms are capable of being released within 2 minutes.

Exception: Provisions for remote locking and unlocking of occupied rooms in Occupancy Condition 4 are not required provided that not more than 10 locks are necessary to be unlocked in order to move occupants from one smoke compartment to a refuge area within 3 minutes. The opening of necessary locks shall be accomplished with not more than two separate keys.

2.20.4.2 **Power-operated doors and locks.** Power-operated sliding doors or power-operated locks for swinging doors shall be operable by a manual release mechanism at the door, and either emergency power or a remote mechanical operating release shall be provided.

Exception: Emergency power is not required in facilities with 10 locks or less complying with the exception to Section 2.20.4.1.

2.20.4.3 **Redundant operation.** Remote release, mechanically operated sliding doors or remote release, mechanically operated locks shall be provided with a mechanically operated release mechanism at each door, or shall be provided with a redundant remote release control.

2.20.4.4 **Relock capability.** Doors remotely unlocked under emergency conditions shall not automatically relock when closed unless specific action is taken at the remote location to enable doors to relock.

2.20.5 **Vertical openings.** Vertical openings shall be enclosed in accordance with Section 4B.7 of SBC 801.

Exception: A floor opening between floor levels of residential housing areas is permitted without enclosure protection between the levels, provided that both of the following conditions are met:

1. The entire normally occupied areas so interconnected are open and unobstructed so as to enable observation of the areas by supervisory personnel.
2. Means of egress capacity is sufficient to provide simultaneous egress for all occupants from all interconnected levels and areas.

The height difference between the highest and lowest finished floor levels shall not exceed 70 m. Each story, considered separately, has at least one-half of its individual required means of egress capacity provided by exits leading directly out of that story without traversing another story within the interconnected area.

2.20.6 **Smoke barrier.** Occupancies in Group I-3 shall have smoke barriers complying with Section 4B.9 to divide every story occupied by residents for sleeping, or any other story having an occupant load of 50 or more persons, into at least two smoke compartments.

Exception: Spaces having direct exit to one of the following, provided that the locking arrangement of the doors involved complies with the requirements for doors at the compartment barrier for the use condition involved:

1. A public way.
2. A building separated from the resident housing area by a 2 hours fire-resistance-rated assembly or 15.3 m of open space.
3. A secured yard or court having a holding space 15.3 m from the housing area that provides 0.56 m^2 or more of refuge area per occupant, including residents, staff and visitors.

2.20.6.1 **Smoke compartments.** The maximum number of residents in any smoke compartment shall be 200. The travel distance to a door in a smoke barrier from any room door required as exit access shall not exceed 46 m. The travel distance to a door in a smoke barrier from any point in a room shall not exceed 61 m.

2.20.6.2 **Refuge area.** At least 0.56 m^2 per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining smoke compartments. This space shall be readily available wherever the occupants are moved across the smoke barrier in a fire emergency.

2.20.6.3 **Independent egress.** A means of egress shall be provided from each smoke compartment created by smoke barriers without having to return through the smoke compartment from which means of egress originates.

2.20.7 **Subdivision of resident housing areas.** Sleeping areas and any contiguous day room, group activity space or other common spaces where residents are housed shall be separated from other spaces in accordance with Sections 2.20.7.1 through 2.20.7.4.

2.20.7.1 **Occupancy Conditions 3 and 4**. Each sleeping area in Occupancy Conditions 3 and 4 shall be separated from the adjacent common spaces by a smoke-tight partition where the travel distance from the sleeping area through the common space to the exit access corridor exceeds 15.3 m.

2.20.7.2 **Occupancy Condition 5**. Each sleeping area in Occupancy Condition 5 shall be separated from adjacent sleeping areas, corridors and common spaces by a smoke-tight partition. Additionally, common spaces shall be separated from the exit access corridor by a smoke-tight partition.

2.20.7.3 **Openings in room face.** The aggregate area of openings in a solid sleeping room face in Occupancy Conditions 2, 3, 4 and 5 shall not exceed 77,419 mm^2. The aggregate area shall include all openings including door undercuts, food passes and grilles. Openings shall be not more than 914 mm above the floor. In Occupancy Condition 5, the openings shall be closeable from the room side.

2.20.7.4 **Smoke-tight doors.** Doors in openings in partitions required to be smoke tight by Section 28.7 shall be substantial doors, of construction that will resist the passage of smoke. Latches and door closures are not required on cell doors.

2.20.8 **Windowless buildings.** For the purposes of this section, a windowless building or portion of a building is one with non-openable windows, windows not readily breakable or without windows. Windowless buildings shall be provided with an engineered smoke control system to provide ventilation (mechanical or natural) in accordance with Section 7.9 for each windowless smoke compartment.

SECTION 2.21
MOTION PICTURE PROJECTION ROOMS

2.21.1 **General.** The provisions of this section shall apply to rooms in which ribbon-type cellulose acetate or other safety film is utilized in conjunction with electric arc, xenon or other light-source projection equipment that develops hazardous gases, dust or radiation. Where cellulose nitrate film is utilized or stored, such rooms shall comply with NFPA 40.

2.21.1.1 **Projection room required.** Every motion picture machine projecting film as mentioned within the scope of this section shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, shall be within the projection room or in an adjacent room of equivalent construction.

2.21.2 **Construction of projection rooms.** Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings are not required to be protected. The room shall have a floor area of not less than 7.44 m^2 for a single machine and at least 3.7 m^2 for each additional machine. Each motion picture projector, floodlight, spotlight or similar piece of equipment shall have a clear working space of not less than 762 by 762 mm on each side and at the rear thereof, but only one such space shall be required between two adjacent projectors. The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 2.3 m. The aggregate of openings for projection equipment shall not exceed 25 percent of the area of the wall between the projection room and the auditorium. Openings shall be provided with glass or other approved material, so as to close completely the opening.

2.21.3 **Projection room and equipment ventilation.** Ventilation shall be provided in accordance with the SBC 501.

2.21.3.1 **Projection room.**

2.21.3.1.1 **Supply air.** Each projection room shall be provided with adequate air supply inlets so arranged as to provide well-distributed air throughout the room. Air inlet ducts shall provide an amount of air equivalent to the amount of air being exhausted by projection equipment. Air is permitted to be taken from the outside; from adjacent spaces within the building, provided the volume and infiltration rate is sufficient; or from the building air-conditioning system, provided it is so arranged as to provide sufficient air when other systems are not in operation.

2.21.3.1.2 **Exhaust air.** Projection rooms are permitted to be exhausted through the lamp exhaust system. The lamp exhaust system shall be positively interconnected with the lamp so that the lamp will not operate unless there is the required airflow. Exhaust air ducts shall terminate at the exterior of the building in such a location that the exhaust air cannot be readily re-circulated into any air supply system. The projection room ventilation system is permitted to also serve appurtenant rooms, such as the generator and rewind rooms.

Each projection machine shall be provided with an exhaust duct that will draw air from each lamp and exhaust it directly to the outside of the building. The lamp exhaust is permitted to serve to exhaust air from the projection room to provide room air circulation. Such ducts shall be of rigid materials except for a flexible connector approved for the purpose. The projection lamp or projection room exhaust system, or both, is permitted to be combined but shall not be interconnected with any other exhaust or return system, or both, within the

building.

2.21.4 **Lighting control.** Provisions shall be made for control of the auditorium lighting and the means of egress lighting systems of theaters from inside the projection room and from at least one other convenient point in the building.

2.21.5 **Miscellaneous equipment.** Each projection room shall be provided with rewind and film storage facilities.

SECTION 2.22
STAGES AND PLATFORMS

2.22.1 **Applicability.** The provisions of this section shall apply to all parts of buildings and structures that contain stages or platforms and similar appurtenances as herein defined.

2.22.2 **Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code requirements, have the meanings shown herein.

FLY GALLERY. A raised floor area above a stage from which the movement of scenery and operation of other stage effects are controlled.

GRIDIRON. The structural framing over a stage supporting equipment for hanging or flying scenery and other stage effects.

PINRAIL. A rail on or above a stage through which belaying pins are inserted and to which lines are fastened.

PLATFORM. A raised area within a building used for religious teaching/ lecturing, the presentation of music, plays or other entertainment; the head table for special guests; the raised area for lecturers and speakers; boxing and wrestling rings; theater-in-the-round stages; and similar purposes wherein there are no overhead hanging curtains, drops, scenery or stage effects other than lighting and sound. A temporary platform is one installed for not more than 30 days.

PROSCENIUM WALL. The wall that separates the stage from the auditorium or assembly seating area.

STAGE. A space within a building utilized for entertainment or presentations, which includes overhead hanging curtains, drops, scenery or stage effects other than lighting and sound. Stage area shall be measured to include the entire performance area and adjacent backstage and support areas not separated from the performance area by fire-resistance-rated construction. Stage height shall be measured from the lowest point on the stage floor to the highest point of the roof or floor deck above the stage.

2.22.3 **Stages.** Stage construction shall comply with Sections 2.23.3.1 through 2.22.3.7.

2.22.3.1 **Stage construction.** Stages shall be constructed of materials as required for floors for the type of construction of the building in which such stages are located.

Exceptions:

1. Stages of Type IIB or IV construction with a nominal 51 mm wood deck, provided that the stage is separated from other areas in accordance with

Section 2.22.3.5.

2. In buildings of Type IIA, IIIA and VA construction, a fire-resistance-rated floor is not required, provided the space below the stage is equipped with an automatic fire-extinguishing system in accordance with Section 7.3 or 7.4.

3. In all types of construction, the finished floor shall be constructed of wood or approved noncombustible materials. Openings through stage floors shall be equipped with tight-fitting, solid wood trap doors with approved safety locks.

2.22.3.1.1 **Stage height and area.** Stage areas shall be measured to include the entire performance area and adjacent backstage and support areas not separated from the performance area by fire-resistance-rated construction. Stage height shall be measured from the lowest point on the stage floor to the highest point of the roof or floor deck above the stage.

2.22.3.2 **Galleries, gridirons, catwalks and pinrails.** Beams designed only for the attachment of portable or fixed theater equipment, gridirons, galleries and catwalks shall be constructed of approved materials consistent with the requirements for the type of construction of the building; and a fire-resistance rating shall not be required. These areas shall not be considered to be floors, stories, mezzanines or levels in applying this code requirements.

Exception: Floors of fly galleries and catwalks shall be constructed of any approved material.

2.22.3.3 **Exterior stage doors.** Where protection of openings is required, exterior exit doors shall be protected with fire doors that comply with Section 4B.15 of SBC 801. Exterior openings that are located on the stage for means of egress or loading and unloading purposes, and that are likely to be open during occupancy of the theater, shall be constructed with vestibules to prevent air drafts into the auditorium.

2.22.3.4 **Proscenium wall.** Where the stage height is greater than 15.3 m, all portions of the stage shall be completely separated from the seating area by a proscenium wall with not less than a 2 hours fire-resistance rating extending continuously from the foundation to the roof.

2.22.3.5 **Proscenium curtain.** The proscenium opening of every stage with a height greater than 15.3 m shall be provided with a curtain of approved material or an approved water curtain complying with Section 7.3.3.1.1. The curtain shall be designed and installed to intercept hot gases, flames and smoke, and to prevent a glow from a severe fire on the stage from showing on the auditorium side for a period of 20 minutes. The closing of the curtain from the full open position shall be effected in less than 30 seconds, but the last 2.4 m of travel shall require not less than 5 seconds.

2.22.3.5.1 **Activation.** The curtain shall be activated by rate-of-rise heat detection installed in accordance with Section 7.7.10 operating at a rate of temperature rise of 8 to 11°C per minute, and by an auxiliary manual control.

2.22.3.5.2 **Fire test.** A sample curtain with a minimum of two vertical seams shall be subjected to the standard fire test specified in ASTM E 119 for a period of 30 minutes. The curtain shall overlap the furnace edges by an amount that is appropriate to seal the top and sides. The curtain shall have a bottom pocket containing a minimum of 58 N/m of batten. The exposed surface of the curtain shall not glow, and flame or smoke shall not penetrate the curtain during the test period. Unexposed surface temperature and hose stream test requirements are not applicable to the proscenium fire safety curtain test.

2.22.3.5.3 **Smoke test.** Curtain fabrics shall have a smoke-developed rating of 25 or less when tested in accordance with ASTM E 84.

2.22.3.5.4 **Tests.** The completed proscenium curtain shall be subjected to operating tests prior

to the issuance of a certificate of occupancy.

2.22.3.6 **Scenery.** Combustible materials used in sets and scenery shall be rendered flame resistant in accordance with Section 6.5. Foam plastics and materials containing foam plastics shall comply with Section 11.3 of this code requirements.

2.22.3.7 **Stage ventilation.** Emergency ventilation shall be provided for stages larger than 93 m^2 in floor area, or with a stage height greater than 15.3 m. Such ventilation shall comply with Section 2.22.3.7.1 or 2.22.3.7.2.

2.22.3.7.1 **Roof vents.** Two or more vents constructed to open automatically by approved heat-activated devices and with an aggregate clear opening area of not less than 5 percent of the area of the stage shall be located near the center and above the highest part of the stage area. Supplemental means shall be provided for manual operation of the ventilator. Curbs shall be provided as required for skylights in Section 11.10.2 of this code requirements. Vents shall be labeled.

2.22.3.7.2 **Smoke control.** Smoke control in accordance with Section 7.9 shall be provided to maintain the smoke layer interface not less than 1.8 m above the highest level of the assembly seating or above the top of the proscenium opening where a proscenium wall is provided in compliance with Section 2.22.3.4.

2.22.4 **Platform construction.** Permanent platforms shall be constructed of materials as required for the type of construction of the building in which the permanent platform is located. Permanent platforms are permitted to be constructed of fire-retardant-treated wood for Type I, II, and IV construction where the platforms are not more than 762 mm above the main floor, and not more than one-third of the room floor area and not more than 279 m^2 in area. Where the space beneath the permanent platform is used for storage or any other purpose other than equipment, wiring or plumbing, the floor construction shall not be less than 1 hour fire-resistant construction. Where the space beneath the permanent platform is used only for equipment, wiring or plumbing, the underside of the permanent platform need not be protected.

2.22.4.1 **Temporary platforms.** Platforms installed for a period of not more than 30 days are permitted to be constructed of any materials permitted by the code. The space between the floor and the platform above shall only be used for plumbing and electrical wiring to platform equipment.

2.22.5 **Dressing and appurtenant rooms.** Dressing and appurtenant rooms shall comply with Sections 2.22.5.1 through 2.22.5.4.

2.22.5.1 **Separation from stage.** Where the stage height is greater than 15.3 m, the stage shall be separated from dressing rooms, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the stage and other parts of the building by a fire barrier wall and horizontal assemblies or both with not less than a 2 hours fire-resistance rating with approved opening protectives. For stage heights of 15.3 m or less, the required stage separation shall be a fire barrier wall and horizontal assemblies, or both, with not less a 1 hour fire-resistance rating with approved opening protectives.

2.22.5.2 **Separation from each other.** Separate dressing rooms for each gender, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the stage shall be separated from each other by fire barrier wall and horizontal assemblies, or both, with not less than a 1 hour fire-resistance rating with approved opening protectives.

2.22.5.3 **Opening protectives.** Openings other than to trunk rooms and the necessary doorways at stage level shall not connect such rooms with the stage, and such openings shall be protected with fire door assemblies that comply with Section

4B.15 of SBC 801.

2.22.5.4 **Stage exits.** At least one approved means of egress shall be provided from each side of the stage; and from each side of the space under the stage. At least one means of escape shall be provided from each fly gallery and from the gridiron. A steel ladder, alternating tread stairway or spiral stairway is permitted to be provided from the gridiron to a scuttle in the stage roof.

2.22.6 **Automatic sprinkler system.** Stages shall be equipped with an automatic fire-extinguishing system in accordance with Chapter 7 of the SBC 801. The system shall be installed under the roof and gridiron, in the tie and fly galleries and in places behind the proscenium wall of the stage and in dressing rooms, lounges, workshops and storerooms accessory to such stages.

Exceptions:

1. Sprinklers are not required under stage areas less than 1.2 m in clear height utilized exclusively for storage of tables and chairs, provided the concealed space is separated from the adjacent spaces by not less than 15.9 mm Type X gypsum board.
2. Sprinklers are not required for stages 93 m^2 or less in area and 15.3 m or less in height where curtains, scenery or other combustible hangings are not retractable vertically. Combustible hangings shall be limited to a single main curtain, borders, legs and a single backdrop.

2.22.7 **Standpipes.** Standpipe systems shall be provided in accordance with Section 7.5.

SECTION 2.23
SPECIAL AMUSEMENT BUILDINGS

2.23.1 **General.** Special amusement buildings having an occupant load of 50 or more shall comply with the requirements for the appropriate Group A occupancy and this section. Amusement buildings having an occupant load of less than 50 shall comply with the requirements for a Group B occupancy and this section.

Exception: Amusement buildings or portions thereof that are without walls or a roof and constructed to prevent the accumulation of smoke.

For flammable decorative materials, see this code requirements.

2.23.2 **Special amusement building.** A special amusement building is any temporary or permanent building or portion thereof that is occupied for amusement, entertainment or educational purposes and that contains a device or system that conveys passengers or provides a walkway along, around or over a course in any direction so arranged that the means of egress path is not readily apparent due to visual or audio distractions or is intentionally confounded or is not readily available because of the nature of the attraction or mode of conveyance through the building or structure.

2.23.3 **Automatic fire detection.** Special amusement buildings shall be equipped with an automatic fire detection system in accordance with Section 7.7.

2.23.4 **Automatic sprinkler system.** Special amusement buildings shall be equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1. Where the special amusement building is temporary, the sprinkler water supply shall be of an approved temporary means.

Exception: Automatic fire sprinklers are not required where the total floor area of a temporary special amusement building is less than (93 m^2) and the travel distance from any point to an exit is less than 15.3 m.

2.23.5 **Alarm.** Actuation of a single smoke detector, the automatic sprinkler system or other automatic fire detection device shall immediately sound an alarm at the building at a constantly attended location from which emergency action can be initiated including the capability of manual initiation of requirements in Section 7.7.2.11.2.

2.23.6 **Emergency voice/alarm communications system.** An emergency voice/alarm communications system shall be provided in accordance with Sections 7.7.2.11 and 7.7.2.12.2, which is also permitted to serve as a public address system and shall be audible throughout the entire special amusement building.

2.23.7 **Exit marking.** Exit signs shall be installed at the required exit or exit access doorways of amusement buildings. Approved directional exit markings shall also be provided. Where mirrors, mazes or other designs are utilized that disguise the path of egress travel such that they are not apparent, approved low level exit signs and directional path markings shall be provided and located not more than 203 mm above the walking surface and on or near the path of egress travel. Such markings shall become visible in an emergency. The directional exit marking shall be activated by the automatic fire detection system and the automatic sprinkler system in accordance with Section 7.7.2.11.2.

2.23.8 **Interior finish.** The interior finish shall be Class A in accordance with Section 6.3.1.

SECTION 2.24
AIRCRAFT-RELATED OCCUPANCIES

2.24.1 **Airport traffic control towers.**

2.24.1.1 **General.** The provisions of this section shall apply to airport traffic control towers not exceeding 140 m^2 per floor occupied only for the following uses:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.
3. Airport terminal radar and electronics rooms.
4. Office spaces incidental to the tower operation.
5. Lounges for employees, including sanitary facilities.

2.24.1.2 **Type of construction.** Airport traffic control towers shall be constructed to conform to the height and area limitations of Table 2.24.1.2.

2.14.1.3 **Egress.** A minimum of one exit stairway shall be permitted for airport traffic control towers of any height provided that the occupant load per floor does not exceed 15. The stairway shall conform to the requirements of Section 8.9. The stairway shall be separated from elevators by a minimum distance of one-half of the diagonal of the area served measured in a straight line. The exit stairway and elevator hoistway are permitted to be located in the same shaft enclosure, provided they are separated from each other by a 4 hour separation having no openings. Such stairway shall be pressurized to a minimum of 43 Pa and a maximum of 101 Pa in the shaft relative to the building with stairway doors closed. Stairways need not extend to the roof as specified in Section 8.9.12. The provisions of Section 2.3 do not apply.

Exception: Smokeproof enclosures as set forth in Section 8.9.1.8 are not required where required stairways are pressurized.

TABLE 2.24.1.2
HEIGHT AND AREA LIMITATIONS FOR AIRPORT TRAFFIC CONTROL TOWERS

TYPE OF CONSTRUCTION	HEIGHT[a] (meters)	MAXIMUM AREA (square meters)
IA	Unlimited	139.4
IB	73	139.4
IIA	30.5	139.4
IIB	26	139.4
IIIA	19.8	139.4

a. Height to be measured from grade to cab floor.

2.24.1.4 **Automatic fire detection systems.** Airport traffic control towers shall be provided with an automatic fire detection system installed in accordance with Section 7.7.2.

2.24.1.5 **Standby power.** A standby power system that conforms to SBC 401 shall be provided in airport traffic control towers more than 19.8 m in height. Power shall be provided to the following equipment:

1. Pressurization equipment, mechanical equipment and lighting.
2. Elevator operating equipment.
3. Fire alarm and smoke detection systems.

2.24.1.6 **Accessibility.** Airport traffic control towers need not be accessible as specified in the provisions of Chapter 13 of this code requirements.

2.24.2 **Aircraft hangar.**

2.24.2.1 **Exterior walls.** Exterior walls located less than 9.1 m from property lines, lot lines or a public way shall have a fire-resistance rating not less than 2 hours.

2.24.2.2 **Basements.** Where hangars have basements, the floor over the basement shall be of Type IA construction and shall be made tight against seepage of water, oil or vapors. There shall be no opening or communication between the basement and the hangar. Access to the basement shall be from outside only.

2.24.2.3 **Floor surface.** Floors shall be graded and drained to prevent water or fuel from remaining on the floor. Floor drains shall discharge through an oil separator to the sewer or to an outside vented sump.

2.24.2.4 Heating equipment. Heating equipment shall be placed in another room separated by 2 hours fire-resistance-rated construction. Entrance shall be from the outside or by means of a vestibule providing a two-doorway separation.

Exceptions:

1. Unit heaters suspended at least 3.1 m above the upper surface of wings or engine enclosures of the highest aircraft that are permitted to be housed in the hangar and at least 2.4 m above the floor in shops, offices and other sections of the hangar communicating with storage or service areas.
2. A single interior door shall be allowed, provided the sources of ignition in the appliances are at least 457 mm above the floor.

2.24.2.5 **Finishing.** The process of “doping,” involving use of a volatile flammable solvent, or of painting, shall be carried on in a separate detached building equipped with automatic fire-extinguishing equipment in accordance with Section 7.3.

2.24.2.6 **Fire suppression.** Aircraft hangars shall be provided with fire suppression as required in NFPA 409.

Exception: Group II hangars as defined in NFPA 409 storing private aircraft without major maintenance or overhaul are exempt from foam suppression

requirements.

2.24.3 **Residential aircraft hangars.** Residential aircraft hangars as defined in Section 2.24.3.1 shall comply with Sections 2.24.3.2 through 2.24.3.6.

2.24.3.1 **Definition.** The following word and term shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the meaning shown herein.

RESIDENTIAL AIRCRAFT HANGAR. An accessory building less than 186 m^2 and 6.1 m in height, constructed on a one- or two-family residential property where aircraft are stored. Such use will be considered as a residential accessory use incidental to the dwelling.

2.24.3.2 **Fire separation.** A hangar shall not be attached to a dwelling unless separated by walls having a fire-resistance rating of not less than 1 hour. Such separation shall be continuous from the foundation to the underside of the roof and un-pierced except for doors leading to the dwelling unit. Doors into the dwelling unit must be equipped with self-closing devices and conform to the requirements of Section 4B.15 of SBC 801 with at least a 102 mm noncombustible raised sill. Openings from a hanger directly into a room used for sleeping purposes shall not be permitted.

2.24.3.3 **Egress.** A hangar shall provide two means of egress. One of the doors into the dwelling shall be considered as meeting only one of the two means of egress.

2.24.3.4 **Smoke detection.** Smoke alarms shall be provided within the hangar in accordance with Section 7.7.2.21.

2.24.3.5 **Independent systems.** Mechanical and plumbing drain, waste and vent (DWV) systems installed within the hangar shall be independent of the systems installed within the dwelling. Building sewer lines may connect outside the structures.

Exception: Smoke detector wiring and feed for electrical sub-panels in the hangar.

2.24.3.6 **Height and area limits.** Residential aircraft hangars shall not exceed 186 m^2 in area and 6.1 m in height.

2.24.4 **Aircraft paint hangars.** Aircraft painting operations where flammable liquids are used in excess of the maximum allowable quantities per control area listed in Table 2.7.7(1) shall be conducted in an aircraft paint hangar that complies with the provisions of Section 2.24.4.

2.24.4.1 **Occupancy group.** Aircraft paint hangars shall be classified as Group H-2. Aircraft paint hangars shall comply with the applicable requirements of this code requirements for such occupancy.

2.24.4.2 **Construction.** The aircraft paint hangar shall be of Type I or II construction.

2.24.4.3 **Operations.** Only those flammable liquids necessary for painting operations shall be permitted in quantities less than the maximum allowable quantities per control area in Table 2.7.7(1). Spray equipment cleaning operations shall be conducted in a liquid use, dispensing and mixing room.

2.24.4.4 **Storage.** Storage of flammable liquids shall be in a liquid storage room.

2.24.4.5 **Fire suppression.** Aircraft paint hangars shall be provided with fire suppression as required in NFPA 409.

2.24.4.6 **Ventilation.** Aircraft paint hangars shall be provided with ventilation as required in the SBC 501.

2.24.5 **Heliports and helistops.**

2.24.5.1 **General.** Heliports and helistops may be erected on buildings or other locations where they are constructed in accordance with this section.

2.24.5.2 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the meanings shown herein.

HELIPORT. An area of land or water or a structural surface that is used, or intended for use, for the landing and taking off of helicopters, and any appurtenant areas that are used, or intended for use, for heliport buildings and other heliport facilities.

HELISTOP. The same as a "Heliport," except that no fueling, de-fueling, maintenance, repairs or storage of helicopters is permitted.

2.24.5.3 **Size.** The touchdown or landing area for helicopters of less than 1,588 kg shall be a minimum of 6.1 m in length and width. The touchdown area shall be surrounded on all sides by a clear area having a minimum average width at roof level of 4.6 m but with no width less than 1.5 m.

2.24.5.4 **Design.** Helicopter landing areas and the supports thereof on the roof of a building shall be noncombustible construction. Landing areas shall be designed to confine any flammable liquid spillage to the landing area itself and provisions shall be made to drain such spillage away from any exit or stairway serving the helicopter landing area or from a structure housing such exit or stairway. For structural design requirements, see SBC 301.

2.24.5.5 **Means of egress.** The means of egress from heliports and helistops shall comply with the provisions of Chapter 8. Landing areas located on buildings or structures shall have two or more means of egress. For landing platforms or roof areas less than 18.3 m in length, or less than 187 m^2 in area, the second means of egress may be a fire escape or ladder leading to the floor below.

2.24.5.6 **Rooftop heliports and helistops.** Rooftop heliports and helistops shall comply with NFPA 418.

SECTION 2.25
COMBUSTIBLE STORAGE

2.25.1 **General.** High-piled stock or rack storage in any occupancy group shall comply with this code requirements.

2.25.2 **Attic, under-floor and concealed spaces.** Attic, under-floor and concealed spaces used for storage of combustible materials shall be protected on the storage side as required for 1 hour fire-resistant construction. Openings shall be protected by assemblies that are self-closing and are of noncombustible construction or solid wood core not less than 45 mm in thickness.

Exceptions:

1. Areas protected by approved automatic sprinkler systems.

2. Group R-3 and U occupancies.

SECTION 2.26
HAZARDOUS MATERIALS

2.26.1 **General.** The provisions of this section shall apply to buildings and structures occupied for the manufacturing, processing, dispensing, use or storage of hazardous materials.

2.26.1.1 **Other provisions.** Buildings and structures with an occupancy in Group H shall also comply with the applicable provisions of Section 2.14 and this code

requirements.

2.26.1.2 **Materials.** The safe design of hazardous material occupancies is material dependent. Individual material requirements are also found in Sections 2.7 and 2.14, and in the SBC 501 and this code requirements.

2.26.1.2.1 **Materials.** The safe design of hazardous material occupancies is material dependent. Individual material requirements are also found in Sections 2.7 and 2.14, and in the SBC 501 and this code requirements.

2.26.1.2.2 **Aerosols.** Level 2 and 3 aerosol products shall be stored and displayed in accordance with this code requirements. See Section 2.11.2 and this code requirements for occupancy group requirements.

2.26.1.3 **Information required.** Separate floor plans shall be submitted for buildings and structures with an occupancy in Group H, identifying the locations of anticipated contents and processes so as to reflect the nature of each occupied portion of every building and structure. A report identifying hazardous materials including, but not limited to, materials representing hazards that are classified in Group H to be stored or used, shall be submitted and the methods of protection from such hazards shall be indicated on the construction documents. The opinion and report shall be prepared by a qualified person, firm or corporation approved by the concerning building official and shall be provided without charge to the enforcing agency.

2.26.2 **Control areas.** Control areas shall be those spaces within a building where quantities of hazardous materials not exceeding the maximum quantities allowed by this code requirements are stored, dispensed, used or handled.

2.26.2.1 **Construction requirements.** Control areas shall be separated from each other by not less than a 1hour fire barrier constructed in accordance with Chapter 4.

2.26.2.2 **Number.** The maximum number of control areas within a building shall be in accordance with Table 2.26.2.2.

TABLE 2.26.2.2
DESIGN AND NUMBER OF CONTROL AREAS

FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA[a]	NUMBER OF CONTROL AREAS PER FLOOR[b]	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS[c]
Above grade	Higher than 9	5	1	2
	7-9	5	2	2
	6	12.5	2	2
	5	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below grade	1	75	3	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Tables 2.7.7(1) and 2.7.7(2), with all increases allowed in the notes to those tables.
b. There shall be a maximum of two control areas per floor in Group M occupancies and in buildings or portions of buildings having Group S occupancies with storage conditions and quantities in accordance with Section 2.26.2.4.
c. Fire barriers shall include walls and floors as necessary to provide separation from other portions of the building.

2.26.2.3 **Separation.** The required fire-resistance rating for fire barrier assemblies shall be in accordance with Table 2.26.2.2. The floor construction of the control area, and the construction supporting the floor of the control area, shall have a minimum 2 hours fire-resistance rating.

2.26.2.4 **Hazardous material in Group M display and storage areas and in Group S storage areas.** The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single control

area of a Group M or S occupancy or an outdoor control area is permitted to exceed the maximum allowable quantities per control area specified in Tables 2.7.7(1) and 2.7.7(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with this code requirements and quantities do not exceed the maximum allowable specified in Table 2.26.2.4.

TABLE 2.26.2.4
MAXIMUM ALLOWABLE QUANTITY PER INDOOR AND OUTDOOR CONTROL AREA IN GROUP M AND S OCCUPANCIES NONFLAMMABLE SOLIDS AND NONFLAMMABLE AND NONCOMBUSTIBLE LIQUIDS [d,e,f]

CONDITION		MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA	
Material[a]	**Class**	**Solids kilograms**	**Liquids liters**
A. Health-hazard materials—nonflammable and noncombustible solids and liquids			
1. Corrosives[b, c]	Not Applicable	4,427	3,690
2. Highly toxics	Not Applicable	9.1[b, c]	7.6[b, c]
3. Toxics[b, c]	Not Applicable	454	379
B. Physical-hazard materials—nonflammable and noncombustible solids and liquids			
1. Oxidizers[b, c]	4	Not Allowed	Not Allowed
	3	522[g]	435
	2	1,022[h]	852
	1	8,172[i, j]	6,813[i, j]
2. Unstable (reactives)[b, c]	4	Not Allowed	Not Allowed
	3	250	208
	2	522	435
	1	Not Limited	Not Limited
3. Water (reactives)	3[b, c]	250	208
	2[, c]	522	435
	1	Not Limited	Not Limited

a. Hazard categories are as specified in this code requirements.
b. Maximum allowable quantities shall be increased 100 percent in buildings that are sprinklered in accordance with Section 7.3.3.1.1. When Note c also applies, the increase for both notes shall be applied accumulatively.
c. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, in accordance with these code requirements. When Note b also applies, the increase for both notes shall be applied accumulatively.
d. See Table 2.26.2.2 for design and number of control areas.
e. Allowable quantities for other hazardous material categories shall be in accordance with Section 2.7.
f. Maximum quantities shall be increased 100 percent in outdoor control areas.
g. Maximum amounts are permitted to be increased to 1,022 kilograms when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 4.5 kilograms each.
h. Maximum amounts are permitted to be increased to 2,043 kilograms when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 4.5 kilograms each.
i. Quantities are unlimited where protected by an automatic sprinkler system.
j. Quantities are unlimited in an outdoor control area.

2.26.3 **Ventilation.** Rooms, areas or spaces of Group H in which explosive, corrosive, combustible, flammable or highly toxic dusts, mists, fumes, vapors or gases are or may be emitted due to the processing, use, handling or storage of materials shall be mechanically ventilated as required by this code requirements and the SBC 501.

Ducts conveying explosives or flammable vapors, fumes or dusts shall extend directly to the exterior of the building without entering other spaces. Exhaust ducts shall not extend into or through ducts and plenums.

Exception: Ducts conveying vapor or fumes having flammable constituents less than 25 percent of their lower flammable limit (LFL) are permitted to pass through other spaces.

Emissions generated at workstations shall be confined to the area in which they are generated as specified in this code requirements and the SBC 501.

The location of supply and exhaust openings shall be in accordance with the SBC 501. Exhaust air contaminated by highly toxic material shall be treated in accordance with this code requirements.
A manual shutoff control for ventilation equipment required by this section shall be provided outside the room adjacent to the principal access door to the room. The switch shall be of the break-glass type and shall be labeled: VENTILATION SYSTEM EMERGENCY SHUTOFF.

2.26.4 **Hazardous material systems.** Systems involving hazardous materials shall be suitable for the intended application. Controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate or path. Automatic controls, where provided, shall be designed to be fail safe.

2.26.5 **Inside storage, dispensing and use.** The inside storage, dispensing and use of hazardous materials in excess of the maximum allowable quantities per control area of Tables 2.7.7(1) and 2.7.7(2) shall be in accordance with Sections 2.26.5.1 through 2.26.5.5 of this code requirements.

2.26.5.1 **Explosion control.** Explosion control shall be provided in accordance with this code requirements as required by Table 2.26.5.1 where quantities of hazardous materials specified in that table exceed the maximum allowable quantities in Table 2.7.7(1) or where a structure, room or space is occupied for purposes involving explosion hazards as required by Section 2.14 or this code requirements.

2.26.5.2 **Monitor control equipment.** Monitor control equipment shall be provided where required by this code requirements.

2.26.5.3 **Automatic fire detection systems.** Group H occupancies shall be provided with an automatic fire detection system in accordance with Section 7.7.2.

2.26.5.4 **Standby or emergency power.** Where mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be provided with an emergency or standby power system in accordance with the SBC 401.

Exceptions:

1. Storage areas for Class I and II oxidizers.
2. Storage areas for Class III, IV and V organic peroxides.
3. Storage, use and handling areas for highly toxic or toxic materials as provided for in this code requirements.
4. Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an approved fail-safe engineered system is installed.

2.26.5.5 **Spill control, drainage and containment.** Rooms, buildings or areas occupied for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off spillage and fire protection water discharged in the storage area where required in this code requirements. The methods of spill control shall be in accordance with the code requirements.

TABLE 2.26.5.1
EXPLOSION CONTROL REQUIREMENTS

MATERIAL	CLASS	EXPLOSION CONTROL METHODS	
		Barricade construction	Explosion (deflagration) venting or explosion (deflagration) prevention systems[b]
HAZARD CATEGORY			
Combustible dusts[c]	—	Not Required	Required
Cryogenic flammables	—	Not Required	Required
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4 Division 1.5 Division 1.6	Required Required Not Required Not Required Required Required	Not Required Not Required Required Required Not Required Not Required
Flammable gas	Gaseous Liquefied	Not Required Not Required	Required Required
Flammable liquid	IA[d] IB[e]	Not Required Not Required	Required Required
Organic peroxides	U I	Required Required	Not Permitted Not Permitted
Oxidizer liquids and solids	4	Required	Not Permitted
Pyrophoric gas	—	Not Required	Required
Unstable (reactive)	4 3 Detonable 3 Nondetonable	Required Required Not Required	Not Permitted Not Permitted Required
Water-reactive liquids and solids	3 2[g]	Not Required Not Required	Required Required
SPECIAL USES			
Acetylene generator rooms	—	Not Required	Required
Grain processing	—	Not Required	Required
Liquefied petroleum gas-distribution facilities	—	Not Required	Required
Where explosion hazards exist[f]	Detonation Deflagration	Required Not Required	Not Permitted Required

a. See Section 2.26.1.3.
b. See other chapters of this code requirements.
c. As generated during manufacturing or processing. See definition of "Combustible dust".
d. Storage or use.
e. In open use or dispensing.
f. Rooms containing dispensing and use of hazardous materials when an explosive environment can occur because of the characteristics or nature of the hazardous materials or as a result of the dispensing or use process.
g. A method of explosion control shall be provided when Class 2 water-reactive materials can form potentially explosive mixtures.

2.26.6 **Outdoor storage, dispensing and use.** The outdoor storage, dispensing and use of hazardous materials shall be in accordance with this code requirements.

2.26.6.1 **Weather protection.** Where weather protection is provided for sheltering outdoor hazardous material storage or use areas, such storage or use shall be considered outdoor storage or use, provided that all of the following conditions are met:

1. Structure supports and walls shall not obstruct more than one side or more than 25 percent of the perimeter of the storage or use area.

2. The distance from the structure and the structure supports to buildings, lot lines, public ways or means of egress to a public way shall not be less than the distance required for an outside hazardous material storage or use area without weather protection.

3. The overhead structure shall be of approved noncombustible construction with a maximum area of 140 m^2.

Exception: The increases permitted by Section 3.6 apply.

2.26.7 **Emergency alarms.** Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided as set forth herein.

2.26.7.1 **Storage.** An approved manual emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm-initiating devices shall be installed outside of each interior exit or exit access door of storage buildings, rooms or areas. Activation of an emergency alarm-initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials.

2.26.7.2 **Dispensing, use and handling.** Where hazardous materials having a hazard ranking of 3 or 4 in accordance with NFPA 704 are transported through corridors or exit enclosures, there shall be an emergency telephone system, a local manual alarm station or an approved alarm-initiating device at not more than 45.7 m intervals and at each exit and exit access doorway throughout the transport route. The signal shall be relayed to an approved central, proprietary or remote station service or constantly attended on-site location and shall also initiate a local audible alarm.

2.26.7.3 **Supervision.** Emergency alarm systems shall be supervised by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

SECTION 2.27
GROUPS H-1, H-2, H-3, H-4 AND H-5

2.27.1 **Scope.** The provisions of this section shall apply to the storage and use of hazardous materials in excess of the maximum allowable quantities per control area listed in Section 2.7.9. Buildings and structures with an occupancy in Group H shall also comply with the applicable provisions of Section 2.26 and this code requirements.

2.27.2 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in the code, have the meanings shown herein.

CONTINUOUS GAS-DETECTION SYSTEM. A gas detection system where the analytical instrument is maintained in continuous operation and sampling is performed without interruption. Analysis is allowed to be performed on a cyclical basis at intervals not to exceed 30 minutes.

EMERGENCY CONTROL STATION. An approved location on the premises where signals from emergency equipment are received and which is staffed by trained personnel.

EXHAUSTED ENCLOSURE. An appliance or piece of equipment that consists of a top, a back and two sides providing a means of local exhaust for capturing gases, fumes, vapors and mists. Such enclosures include laboratory hoods, exhaust fume hoods and similar appliances and equipment used to locally retain and exhaust the gases, fumes, vapors and mists that could be released. Rooms or areas provided with general ventilation, in themselves, are not exhausted enclosures.

FABRICATION AREA. An area within a semiconductor fabrication facility and related research and development areas in which there are processes using hazardous production materials. Such areas are allowed to include ancillary rooms or areas such as dressing rooms and offices that are directly related to the fabrication area processes.

FLAMMABLE VAPORS OR FUMES. The concentration of flammable constituents in air that exceed 10 percent of their lower flammable limit (LFL).

GAS CABINET. A fully enclosed, noncombustible enclosure used to provide an isolated environment for compressed gas cylinders in storage or use. Doors and access ports for exchanging cylinders and accessing pressure-regulating controls are allowed to be included.

GAS ROOM. A separately ventilated, fully enclosed room in which only compressed gases and associated equipment and supplies are stored or used.

HAZARDOUS PRODUCTION MATERIAL (HPM). A solid, liquid or gas associated with semiconductor manufacturing that has a degree-of-hazard rating in health, flammability or reactivity of Class 3 or 4 as ranked by NFPA 704 and which is used directly in research, laboratory or production processes that have as their end product materials that are not hazardous.

HPM FLAMMABLE LIQUID. An HPM liquid that is defined as either a Class I flammable liquid or a Class II or Class IIIA combustible liquid.

HPM ROOM. A room used in conjunction with or serving a Group H-5 occupancy, where HPM is stored or used and which is classified as a Group H-2, H-3 or H-4 occupancy.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH). The concentration of airborne contaminants which poses a threat of death, immediate or delayed permanent adverse health effects, or effects that could prevent escape from such an environment. This contaminant concentration level is established by the National Institute of Occupational Safety and Health (NIOSH) based on both toxicity and flammability. It generally is expressed in parts per million by volume (ppm v/v) or milligrams per cubic meter (mg/m^3). If adequate data do not exist for precise establishment of IDLH concentrations, an independent certified industrial hygienist, industrial toxicologist, appropriate regulatory agency or other source approved by the code official shall make such determination.

LIQUID. A material that has a melting point that is equal to or less than 20°C and a boiling point that is greater than 20°C at 101 kPa. When not otherwise identified, the term “liquid” includes both flammable and combustible liquids.

LIQUID STORAGE ROOM. A room classified as a Group H-3 occupancy used for the storage of flammable or combustible liquids in an unopened condition.

LIQUID USE, DISPENSING AND MIXING ROOMS. Rooms in which Class I, II and IIIA flammable or combustible liquids are used, dispensed or mixed in open containers.

LOWER FLAMMABLE LIMIT (LFL). The minimum concentration of vapor in air at which propagation of flame will occur in the presence of an ignition source. The LFL is sometimes referred to as “LEL” or “lower explosive limit.”

NORMAL TEMPERATURE AND PRESSURE (NTP). A temperature of 21°C and a pressure of 101 kPa.

SERVICE CORRIDOR. A fully enclosed passage used for transporting HPM and purposes other than required means of egress.

SOLID. A material that has a melting point, decomposes or sublimes at a temperature greater than 20°C.

STORAGE, HAZARDOUS MATERIALS.
1. The keeping, retention or leaving of hazardous materials in closed containers, tanks, cylinders or similar vessels, or
2. Vessels supplying operations through closed connections to the vessel.

USE (MATERIAL). Placing a material into action, including solids, liquids and gases.

WORKSTATION. A defined space or an independent principal piece of equipment using HPM within a fabrication area where a specific function, laboratory procedure or research activity occurs. Approved or listed hazardous materials storage cabinets, flammable liquid storage cabinets or gas cabinets serving a workstation are included as part of the workstation. A workstation is allowed to contain ventilation equipment, fire protection devices, detection devices, electrical devices and other processing and scientific equipment.

2.27.3 **Location on property.** Group H shall be located on property in accordance with the other provisions of this chapter. In Group H-2 or H-3, not less than 25 percent of the perimeter wall of the occupancy shall be an exterior wall.
Exceptions:
1. Liquid use, dispensing and mixing rooms having a floor area of not more than 46.5 m^2 need not be located on the outer perimeter of the building where they are in accordance with this code requirements and NFPA 30.
2. Liquid storage rooms having a floor area of not more than 93 m^2 need not be located on the outer perimeter where they are in accordance with this code requirements and NFPA 30.
3. Spray paint booths that comply with this code requirements need not be located on the outer perimeter.

2.27.3.1 **Group H minimum distance to lot lines.** Regardless of any other provisions, buildings containing Group H occupancies shall be set back a minimum distance from lot lines as set forth in Items 1 through 4 below. Distances shall be measured from the walls enclosing the occupancy to lot lines, including those on a public way. Distances to assumed property lines drawn for the purposes of determination of exterior wall and opening protection are not to be used to establish the minimum distance for separation of buildings on sites where explosives are manufactured or used when separation is provided in accordance with the quantity distance tables specified for explosive materials in this code requirements.
1. Group H-1. Not less than 23 m and not less than required by this code requirements.

Exceptions:
1. Fireworks manufacturing buildings separated in accordance with NFPA 1124.
2. Buildings containing the following materials when separated in accordance with Table 2.27.3.1:
   2.1 Organic peroxides, unclassified detonable.
   2.2 Unstable reactive materials Class 4.

2.3 Unstable reactive materials, Class 3 detonable.
2.4 Detonable pyrophoric materials.

2. Group H-2. Not less than 9.1 m where the area of the occupancy exceeds 93 m^2 and it is not required to be located in a detached building.
3. Groups H-2 and H-3. Not less than 15.3 m where a detached building is required (see Table 2.27.3.2).
4. Groups H-2 and H-3. Occupancies containing materials with explosive characteristics shall be separated as required by the code requirements. Where separations are not specified, the distances required shall not be less than the distances required by Table 2.28.3.1.

TABLE 2.27.3.1
MINIMUM SEPARATION DISTANCES FOR BUILDINGS CONTAINING EXPLOSIVE MATERIALS

QUANTITY OF EXPLOSIVE MATERIAL[a]		MINIMUM DISTANCE (meters)		
		Lot lines[b] and inhabited buildings[c]		
Kilograms over	Kilograms not over	Barricaded[d]	Unbarricaded	Separation of magazines [d,e,f,]
0.9	2.3	21	43	3.7
2.3	4.5	27	55	4.9
4.5	9.1	34	67	6.1
9.1	13.6	38	76	6.7
13.6	18.2	43	85	7.3
18.2	22.7	46	91	8.5
22.7	34.1	52	104	9.1
34.1	45.4	58	116	9.8
45.4	56.8	61	122	11
56.8	68.1	66	131	11.6
68.1	90.8	72	143	12.8
90.8	113.5	78	155	14
113.5	136.2	82	165	14.6
136.2	181.6	90	180	16.5
181.6	227.0	98	195	17.7
227.0	272.4	104	207	19
272.4	317.8	108	216	19.5
317.8	363.2	114	229	20
363.2	408.6	119	238	21
408.6	454.0	122	244	22
454.0	544.8	130	259	24
544.8	635.6	137	274	25
635.6	726.4	143	287	26
726.4	817.2	149	299	27
817.2	454	154	308	27
908	1,135	166	332	30
1,135	1,362	177	354	32
1,362	1,816	194	387	35
1,816	2,270	209	418	37
2,270	2,724	223	445	40
2,724	3,178	235	469	41
3,178	3,632	244	488	44
3,632	4,086	255	509	46
4,086	4,540	264	527	48
4,540	5,448	267	533	50
5,448	6,356	270	539	53
6,356	7,264	274	549	55
7,264	8,172	287	573	57

(continued)

TABLE 2.27.3.1—continued
MINIMUM SEPARATION DISTANCES FOR BUILDINGS CONTAINING EXPLOSIVE MATERIALS

QUANTITY OF EXPLOSIVE MATERIAL[a]		MINIMUM DISTANCE (meters)		
		Lot lines[b] and inhabited buildings[c]		
Kilograms over	Kilograms not over	Barricaded[d]	Unbarricaded	Separation of magazines [d,e,f,]
8,172	9,080	297	594	60
9,080	11,350	322	610	64
11,350	13,620	344	610	68
13,620	15,890	367	610	73
15,890	18,160	389	610	76
18,160	20,430	408	610	79
20,430	22,700	427	610	82
22,700	24,970	445	610	85
24,970	27,240	462	610	88
27,240	29,510	477	610	91
29,510	31,780	491	610	94
31,780	34,050	504	610	98
34,050	36,320	517	610	101
36,320	38,590	527	610	104
38,590	40,860	536	610	107
40,860	43,130	546	610	110
43,130	45,400	553	610	113
45,400	49,940	559	610	119
49,940	54,480	565	610	125
54,480	59,020	572	610	131
59,020	63,560	576	610	137
63,560	68,100	579	610	143
68,100	72,640	590	610	149
72,640	77,180	599	610	155
77,180	81,720	607	610	162
81,720	86,260	613	613	168
86,260	90,800	619	619	174
90,800	95,340	626	626	180
95,340	104,420	640	640	192
104,420	113,500	657	657	204
113,500	124,850	675	675	219
124,850	136,200	693	693	235

a. The number of kilograms of explosives listed is the number of pounds of trinitrotoluene (TNT) or the equivalent kilograms of other explosive.

b. The distance listed is the distance to lot line, including lot lines at public ways.

c. For the purpose of this table, an inhabited building is any building on the same property that is regularly occupied by people. Where two or more buildings containing explosives or magazines are located on the same property, each building or magazine shall comply with the minimum distances specified from inhabited buildings and, in addition, they shall be separated from each other by not less than the distance shown for “Separation of magazines,” except that the quantity of explosive materials contained in detonator buildings or magazines shall govern in regard to the spacing of said buildings or magazines from buildings or magazines, as a group, shall be considered as one building or magazine, and the total quantity of explosive materials stored in such group shall be treated as if the explosive were in a single building or magazine located on the site of any building or magazine of the group, and shall comply with the minimum distance specified from other magazines or inhabited buildings.

d. Barricades shall effectively screen the building containing explosives from other buildings, public ways or magazines. Where mounds or reverted walls of earth are used for barricades, they shall not be less than 0.9 meter in thickness. A straight line from the top of any side wall of the building containing explosive materials to the eave line of any other building, magazine or a point 3.7 meters above the centerline of a public way shall pass through the barricades.

e. Magazine is a building or structure, other than an operating building, approved for storage of explosive materials. Portable or mobile magazines not exceeding 11 m^2 in area need not comply with the requirements of this code, however, all magazines shall comply with this code requirements.

f. The distance listed is permitted be reduced by 50 percent where approved natural or artificial barriers are provided in accordance with the requirements in Note d.

2.27.3.2 Group H-1 and H-2 or H-3 detached buildings. Where a detached building is required by Table 2.27.3.2, there are no requirements for wall and opening protection based on location on property.

TABLE 2.27.3.2
REQUIRED DETACHED STORAGE

DETACHED STORAGE IS REQUIRED WHEN THE QUANTITY OF MATERIAL EXCEEDS THAT LISTED HEREIN			
Material	**Class**	**Solids and Liquids (tonnes)[a,b]**	**Gases (cubic meters)[a,b]**
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4 Division 1.4[c] Division 1.5 Division 1.7	Maximum Allowable Quantity Maximum Allowable Quantity Maximum Allowable Quantity Maximum Allowable Quantity 0.907 Maximum Allowable Quantity Maximum Allowable Quantity	Not Applicable
Oxidizers	Class 4	Maximum Allowable Quantity	Maximum Allowable Quantity
Unstable (reactives) detonable	Class 3 or 4	Maximum Allowable Quantity	Maximum Allowable Quantity
Oxidizer, liquids and solids	Class 3 Class 2	1,089 1,814	Not Applicable Not Applicable
Organic peroxides	Detonable Class I Class II Class III	Maximum Allowable Quantity Maximum Allowable Quantity 22.7 45.4	Not Applicable Not Applicable Not Applicable Not Applicable
Unstable (reactives) nondetonable	Class 3 Class 2	0.907 22.7	57 283
Water reactives	Class 3 Class 2	0.907 22.7	Not Applicable Not Applicable
Pyrphoric gases	Not Applicable	Not Applicable	57

a. For materials that are detonable, the distance to other buildings or lot lines shall be as specified in Table 2.28.3.1 based on trinitrotoluene (TNT) equivalence of the material. For materials classified as explosives, see Chapter 31. For all other materials, the distance shall be as indicated in Section 2.28.3.1.
b. Maximum Allowable Quantity" means the maximum allowable quantity per control area set forth in Table 2.7.7(1).
c. Limited to Division 1.4 materials and articles, including articles packaged for shipment, that are not regulated as an explosive under MOI (Bureau of Alcohol, Tobacco and Firearms (BATF)) regulations or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles, providing the net explosive weight of individual articles does not exceed 0.5 kilograms.

2.27.4 Special provisions for Group H-1 occupancies. Group H-1 occupancies shall be in buildings used for no other purpose, shall not exceed one story in height and be without basement, crawl spaces or other under-floor spaces. Roofs shall be of lightweight construction with suitable thermal insulation to prevent sensitive material from reaching its decomposition temperature.

Group H-1 occupancies containing materials which are in themselves both physical and health hazards in quantities exceeding the maximum allowable quantities per control area in Table 2.7.7(2) shall comply with requirements for both Group H-1 and H-4 occupancies.

2.27.4.1 Floors in storage rooms. Floors in storage areas for organic peroxides, pyrophoric materials and unstable (reactive) materials shall be of liquid-tight, noncombustible construction.

2.27.5 Special provisions for Group H-2 and H-3 occupancies. Group H-2 and H-3 occupancies containing quantities of hazardous materials in excess of those set forth in Table 2.27.3.2 shall be in buildings used for no other purpose, shall not exceed one story in height and shall be without basements, crawl spaces or other under-floor spaces.

Group H-2 and H-3 occupancies containing water-reactive materials shall be resistant to water penetration. Piping for conveying liquids shall not be over or through areas containing water reactives, unless isolated by approved liquid-tight construction.

Exception: Fire protection piping.

2.27.5.1 **Floors in storage rooms.** Floors in storage areas for organic peroxides, oxidizers, pyrophoric materials, unstable (reactive) materials and water-reactive solids and liquids shall be of liquid-tight, noncombustible construction.

2.27.5.2 **Waterproof room.** Rooms or areas used for the storage of water-reactive solids and liquids shall be constructed in a manner that resists the penetration of water through the use of waterproof materials. Piping carrying water for other than approved automatic fire sprinkler systems shall not be within such rooms or areas.

2.27.6 **Smoke and heat venting.** Smoke and heat vents complying with Section 7.10 shall be installed in the following locations:

1. In occupancies classified as Group H-2 or H-3, any of which are over 1,394 m^2 in single floor area.
   Exception: Buildings of noncombustible construction containing only non-combustible materials.
2. In areas of buildings in Group H used for storing Class 2, 3 and 4 liquid and solid oxidizers, Class 1 and unclassified detonable organic peroxides, Class 3 and 4 unstable (reactive) materials, or Class 2 or 3 water-reactive materials as required for a Class V hazard classification.
   Exception: Buildings of noncombustible construction containing only non-combustible materials.

2.27.7 **Group H-2.** Occupancies in Group H-2 shall be constructed in accordance with Sections 2.27.7.1 through 2.27.7.4 and this code.

2.27.7.1 **Combustible dusts, grain processing and storage.** The provisions of Sections 2.28.7.1.1 through 2.27.7.1.5 shall apply to buildings in which materials that produce combustible dusts are stored or handled. Buildings that store or handle combustible dusts shall comply with the applicable provisions of NFPA 61, NFPA 120, NFPA 651, NFPA 654, NFPA 655, NFPA 664 and NFPA 85, and this code.

2.27.7.1.1 **Type of construction and height exceptions.** Buildings shall be constructed in compliance with the height and area limitations of Chapter 3 for Group H-2; except that where erected of Type I or II construction, the heights and areas of grain elevators and similar structures shall be unlimited, and where of Type IV construction, the maximum height shall be 20 m and except further that, in isolated areas, the maximum height of Type IV structures shall be increased to 26 m.

2.27.7.1.2 **Grinding rooms.** Every room or space occupied for grinding or other operations that produce combustible dusts shall be enclosed with fire barriers and horizontal assemblies or both that have not less than a 2 hours fire-resistance rating where the area is not more than 279 m^2, and not less than a 4-hour fire-resistance rating where the area is greater than 279 m^2.

2.27.7.1.3 **Conveyors.** Conveyors, chutes, piping and similar equipment passing through the enclosures of rooms or spaces shall be constructed dirt tight and vapor tight, and be of approved noncombustible materials complying with SBC 501.

2.27.7.1.4 **Explosion control.** Explosion control shall be provided as specified in this code requirements, or spaces shall be equipped with the equivalent mechanical ventilation complying with the SBC 501.

2.27.7.1.5 **Grain elevators.** Grain elevators, non-alcoholic malt houses and buildings for similar occupancies shall not be located within 9.1 m of interior lot lines or structures on the same lot, except where erected along a railroad right-of-way.

2.27.7.1.6 **Coal pockets.** Coal pockets located less than 9.1 m from interior lot lines or from structures on the same lot shall be constructed of not less than Type IB construction. Where more than 9.1 m from interior lot lines, or where erected along a railroad right-of-way, the minimum type of construction of such structures

not more than 20 m in height shall be Type IV.

2.27.7.2 **Flammable and combustible liquids.** The storage, handling, processing and transporting of flammable and combustible liquids shall be in accordance with the SBC 501 and this code requirements.

2.27.7.2.1 **Mixed occupancies.** Where the storage tank area is located in a building of two or more occupancies, and the quantity of liquid exceeds the maximum allowable quantity for one control area, the use shall be completely separated from adjacent fire areas in accordance with the requirements of Section 2.2.3.2.

2.27.7.2.1.1 **Height exception.** Where storage tanks are located within only a single-story building, the height limitation of Section 3.3 shall not apply for Group H.

2.27.7.2.2 **Tank protection.** Storage tanks shall be noncombustible and protected from physical damage. A fire barrier wall or horizontal assemblies or both around the storage tank(s) shall be permitted as the method of protection from physical damage.

2.27.7.2.3 **Tanks.** Storage tanks shall be approved tanks conforming to the requirements of this code requirements.

2.27.7.2.4 **Suppression.** Group H shall be equipped throughout with an approved automatic sprinkler system, installed in accordance with Section 7.3.

2.27.7.2.5 **Leakage containment.** A liquid-tight containment area compatible with the stored liquid shall be provided. The method of spill control, drainage control and secondary containment shall be in accordance with this code requirements.

Exception: Rooms where only double-wall storage tanks conforming to Section 2.27.7.2.3 are used to store Class I, II and IIIA flammable and combustible liquids shall not be required to have a leakage containment area.

2.27.7.2.6 **Leakage alarm.** An approved automatic alarm shall be provided to indicate a leak in a storage tank and room. The alarm shall sound an audible signal, 15 dBA above the ambient sound level, at every point of entry into the room in which the leaking storage tank is located. An approved sign shall be posted on every entry door to the tank storage room indicating the potential hazard of the interior room environment, or the sign shall state: WARNING, WHEN ALARM SOUNDS, THE ENVIRONMENT WITHIN THE ROOM MAY BE HAZARDOUS. The leakage alarm shall also be supervised in accordance with Chapter 13 to transmit a trouble signal.

2.27.7.2.7 **Tank vent.** Storage tank vents for Class I, II or IIIA liquids shall terminate to the outdoor air in accordance with this code requirements.

2.27.7.2.8 **Room ventilation.** Storage tank areas storing Class I, II or IIIA liquids shall be provided with mechanical ventilation. The mechanical ventilation system shall be in accordance with the SBC 501 and this code requirements.

2.27.7.2.9 **Explosion venting.** Where Class I liquids are being stored, explosion venting shall be provided in accordance with this code.

2.27.7.2.10 **Tank openings other than vents.** Tank openings other than vents from tanks inside buildings shall be designed to ensure that liquids or vapor concentrations are not released inside the building.

2.27.7.3 **Liquefied petroleum gas-distribution facilities.** The design and construction of propane, butane, propylene, butylene and other liquefied petroleum gas-distribution facilities shall conform to the applicable provisions of Sections 2.27.7.3.1 through 2.27.7.3.5.2. The storage and handling of liquefied petroleum gas systems shall conform to this code requirements. The design and installation of piping, equipment and systems that utilize liquefied petroleum gas shall be in accordance with and approved method. Liquefied petroleum gas-distribution facilities shall be ventilated in accordance with the SBC 501 and Section

2.27.7.3.1.

2.27.7.3.1 **Air movement.** Liquefied petroleum gas-distribution facilities shall be provided with air inlets and outlets arranged so that air movement across the floor of the facility will be uniform. The total area of both inlet and outlet openings shall be at least 645 mm^2 for each 0.093 m^2 of floor area. The bottom of such openings shall not be more than 152 mm above the floor.

2.27.7.3.2 **Construction.** Liquefied petroleum gas-distribution facilities shall be constructed in accordance with Section 2.27.7.3.3 for separate buildings, Section 2.27.7.3.4 for attached buildings or Section 2.27.7.3.5 for rooms within buildings.

2.27.7.3.3 **Separate buildings.** Where located in separate buildings, liquefied petroleum gas-distribution facilities shall be occupied exclusively for that purpose or for other purposes having similar hazards. Such buildings shall be limited to one story in height and shall conform to Sections 2.27.7.3.3.1 through 2.27.7.3.3.3.

2.27.7.3.3.1 **Floors.** The floor shall not be located below ground level and any spaces beneath the floor shall be solidly filled or shall be unenclosed.

2.27.7.3.3.2 **Materials.** Walls, floors, ceilings, columns and roofs shall be constructed of noncombustible materials.

2.27.7.3.3.3 **Explosion venting.** Explosion venting shall be provided in accordance with this code requirements.

2.27.7.3.4 **Attached buildings.** Where liquefied petroleum gas-distribution facilities are located in an attached structure, the attached perimeter shall not exceed 50 percent of the perimeter of the space enclosed and the facility shall comply with Sections 2.27.7.3.3 and 2.27.7.3.4.1. Where the attached perimeter exceeds 50 percent, such facilities shall comply with Section 2.27.7.3.5.

2.27.7.3.4.1 **Fire separation assemblies.** Separation of the attached structures shall be provided by fire barrier walls and horizontal assemblies, or both, having a fire-resistance rating of not less than 1 hour and shall not have openings. Fire barrier walls and horizontal assemblies, or both, between attached structures occupied only for the storage of LP-gas are permitted to have fire doors that comply with Section 4B.14 of SBC 801 Such fire barrier walls and horizontal assemblies, or both, shall be designed to withstand a static pressure of at least 4,788 Pa, except where the building to which the structure is attached is occupied by operations or processes having a similar hazard.

2.27.7.3.5 **Rooms within buildings.** Where liquefied petroleum gas-distribution facilities are located in rooms within buildings, such rooms shall be located in the first story above grade plane and shall have at least one exterior wall with sufficient exposed area to provide explosion venting as required in this code requirements. The building in which the room is located shall not have a basement or unventilated crawl space and the room shall comply with Sections 2.28.7.3.5.1 and 2.28.7.3.5.2.

2.27.7.3.5.1 **Materials.** Walls, floors, ceilings and roofs of such rooms shall be constructed by an approved noncombustible materials.

2.27.7.3.5.2 **Common construction.** Walls and floor/ceiling assemblies common to the room and to the building within which the room is located shall have a fire barrier wall and horizontal assembly or both of not less than 1 hour and without openings. Common walls for rooms occupied only for storage of LP-gas are permitted to have opening protectives complying with Section 4B.14. Such walls and ceiling shall be designed to withstand a static pressure of at least 4,788 Pa.

Exception: Where the building, within which the room is located, is occupied by operations or processes having a similar hazard.

2.27.7.4 **Dry cleaning plants.** The construction and installation of dry cleaning plants shall be in accordance with the requirements of this code requirements, the SBC 501, the SBC 701 and NFPA 32. Dry cleaning solvents and systems shall be classified

in accordance with this code.

2.27.8 **Groups H-3 and H-4.** Groups H-3 and H-4 shall be constructed in accordance with the applicable provisions of this code requirements.

2.27.8.1 **Gas rooms.** When gas rooms are provided, such rooms shall be separated from other areas by not less than a 1hour fire barrier.

2.27.8.2 **Floors in storage rooms.** Floors in storage areas for corrosive liquids and highly toxic or toxic materials shall be of liquid-tight, noncombustible construction.

2.27.8.3 **Separation–highly toxic solids and liquids.** Highly toxic solids and liquids not stored in approved hazardous materials storage cabinets shall be isolated from other hazardous materials storage by construction having a 1 hour fire-resistance rating.

2.27.9 **Group H-5.**

2.27.9.1 **General.** In addition to the requirements set forth elsewhere in this code requirements, Group H-5 shall comply with the provisions of Section 2.28.9 and the code requirements.

2.27.9.2 **Fabrication areas.**

2.27.9.2.1 **Hazardous materials in fabrication areas.**

2.27.9.2.1.1 **Aggregate quantities.** The aggregate quantities of hazardous materials stored and used in a single fabrication area shall not exceed the quantities set forth in Table 2.27.9.2.1.1.

Exception: The quantity limitations for any hazard category in Table 2.27.9.2.1.1 shall not apply where the fabrication area contains quantities of hazardous materials not exceeding the maximum allowable quantities per control area established by Tables 2.7.7(1) and 2.7.7(2).

2.27.9.2.1.2 **Hazardous production materials.** The maximum quantities of hazardous production materials stored in a single fabrication area shall not exceed the maximum allowable quantities per control area established by Tables 2.7.7(1) and 2.7.7(2).

2.27.9.2.2 **Separation.** Fabrication areas, whose sizes are limited by the quantity of hazardous materials allowed by Table 2.27.9.2.1.1, shall be separated from each other, from exit access corridors, and from other parts of the building by not less than 1hour fire barriers.

Exceptions:

1. Doors within such fire barrier walls, including doors to corridors, shall be only self-closing fire assemblies having a fire-protection rating of not less than 3/4 hour.
2. Windows between fabrication areas and exit access corridors are permitted to be fixed glazing listed and labeled for a fire protection rating of at least 3/4 hour in accordance with Section 4B.14 of SBC 801.

2.27.9.2.3 **Location of occupied levels.** Occupied levels of fabrication areas shall be located at or above the first story above grade plane.

2.27.9.2.4 **Floors.** Except for surfacing, floors within fabrication areas shall be of noncombustible construction.

Openings through floors of fabrication areas are permitted to be unprotected where the interconnected levels are used solely for mechanical equipment directly related to such fabrication areas (see also Section 2.27.9.2.5).

Floors forming a part of an occupancy separation shall be liquid tight.

**TABLE 2.27.9.2.1.1
QUANTITY LIMITS FOR HAZARDOUS MATERIALS IN
A SINGLE FABRICATION AREA IN GROUP H-5[a]**

HAZARD CATEGORY		SOLIDS (kg / m^2)	LIQUIDS ($liters / m^2$)	GAS (m^3 @ NTP/m^2)
PHYSICAL-HAZARD MATERIALS				
Combustible dust		Note b	Not Applicable	Not Applicable
Combustible fiber	Loose Baled	Note b Note b	Not Applicable	Not Applicable
Combustible liquid Combination Class I, II and IIIA	II IIIA IIIB	Not Applicable	0.00025 0.0005 Not Limited 0.001	Not Applicable
Cryogenic gas	Flammable Oxidizing	Not Applicable	Not Applicable	Note c 0.38
Explosives		Note b	Note b	Note b
Flammable gas	Gaseous Liquefied	Not Applicable	Not Applicable	Note b Note c
Flammable liquid Combination Class IA, IB and IC Combination Class I, II and IIIA	A IB IC	Not Applicable	0.00006 0.00063 0.00063 0.00063 0.001	Not Applicable
Flammable solid		0.005	Not Applicable	Not Applicable
Organic peroxide	Unclassified detonable Class I Class II Class III Class IV Class V	Note b Note b 0.122 0.488 Not Limited Not limited	Not Applicable	Not Applicable
Oxidizing gas Combination of gaseous and liquefied	Gaseous Liquefied	Not Applicable	Not Applicable	0.38 0.38 0.38
Oxidizer Combination	Class 4 Class 3 Class 2 Class 1 Class 1, 2, 3	Note b 0.015 0.015 0.015 0.015	Note b 0.00008 0.00008 0.00008 0.00008	Not Applicable
Pyrophoric material		Note b	0.00003	Notes c and d
Unstable reactive	Class 4 Class 3 Class 2 Class 1	Note b 0.122 0.488 Not Limited	Note b 0.00006 0.00025 Not Limited	Note b Note b Note b Not Limited
Water reactive	Class 3 Class 2 Class 1	Note b 1.22 Not Limited	0.00003 0.00063 Not Limited	Not Applicable
HEALTH-HAZARD MATERIALS				
Corrosives		Not Limited	Not Limited	Not Limited
Highly toxic		Not Limited	Not Limited	Note c
Toxics		Not Limited	Not Limited	Note c

a. Hazardous materials within piping shall not be included in the calculated quantities.
b. Quantity of hazardous materials in a single fabrication shall not exceed the maximum allowable quantities per control area in Tables 2.7.7(1) and 2.7.7(2).
c. The aggregate quantity of flammable, pyrophoric, toxic and highly toxic gases shall not exceed 255 cubic meters at NTP.
d. The aggregate quantity of pyrophoric gases in the building shall not exceed the amounts set forth in Table 2.27.3.2.

2.27.9.2.5 **Shafts and openings through floors.** Elevator shafts, vent shafts and other openings through floors shall be enclosed when required by Section 4B.7 of SBC 801. Mechanical, duct and piping penetrations within a fabrication area shall not extend through more than two floors. The annular space around penetrations for cables, cable trays, tubing, piping, conduit or ducts shall be sealed at the floor level to restrict the movement of air. The fabrication area, including the areas through which the ductwork and piping extend, shall be considered a single conditioned environment.

2.27.9.2.6 **Ventilation.** Mechanical exhaust ventilation shall be provided throughout the fabrication area at the rate of not less than 0.044 L/S/m^2 of floor area. The exhaust air duct system of one fabrication area shall not connect to another duct system outside that fabrication area within the building.

A ventilation system shall be provided to capture and exhaust fumes and vapors at workstations.

Two or more operations at a workstation shall not be connected to the same exhaust system where either one or the combination of the substances removed could constitute a fire, explosion or hazardous chemical reaction within the exhaust duct system.

Exhaust ducts penetrating occupancy separations shall be contained in a shaft of equivalent fire-resistance construction. Exhaust ducts shall not penetrate fire walls. Fire dampers shall not be installed in exhaust ducts.

2.27.9.2.7 **Transporting hazardous production materials to fabrication areas.** Hazardous production materials shall be transported to fabrication areas through enclosed piping or tubing systems that comply with Section 2.27.9.6.1, through service corridors complying with Section 2.27.9.4, or in exit access corridors as permitted in the exception to Section 2.27.9.3. The handling or transporting of hazardous production materials within service corridors shall comply with this code requirements.

2.27.9.2.8 **Electrical.**

2.27.9.2.8.1 **General.** Electrical equipment and devices within the fabrication area shall comply with the SBC 401. The requirements for hazardous locations need not be applied where the average air change is at least four times that set forth in Section 2.27.9.2.6 and where the number of air changes at any location is not less than three times that required by Section 2.27.9.2.6. The use of recirculated air shall be permitted.

2.27.9.2.8.2 **Workstations.** Workstations shall not be energized without adequate exhaust ventilation. See Section 2.27.9.2.6 for workstation exhaust ventilation requirements.

2.27.9.3 **Exit access corridors.** Exit access corridors shall comply with Chapter 8 and shall be separated from fabrication areas as specified in Section 2.27.9.2.2. Exit access corridors shall not contain HPM and shall not be used for transporting such materials, except through closed piping systems as provided in Section 2.27.9.6.3.

Exception: Where existing fabrication areas are altered or modified, HPM is allowed to be transported in existing exit access corridors, subject to the following conditions:

1. **Corridors.** Exit access corridors adjacent to the fabrication area where the alteration work is to be done shall comply with Section 8.16 for a length determined as follows:
   1.1 The length of the common wall of the corridor and the fabrication area; and
   1.2 For the distance along the exit access corridor to the point of entry of HPM into the exit access corridor serving that fabrication area.
2. **Emergency alarm system.** There shall be an emergency telephone system, a local manual alarm station or other approved alarm-initiating device within exit access corridors at not more than 46 m intervals and at each exit and exit access doorway. The signal shall be relayed to an approved central, proprietary or remote station service or the emergency control station and shall also initiate a local audible alarm.
3. **Pass-throughs.** Self-closing doors having a fire-protection rating of not less than 1 hour shall separate pass-throughs from existing exit access corridors.

Pass-throughs shall be constructed as required for the exit access corridors, and protected by an approved automatic fire-extinguishing system.

2.27.9.4 **Service corridors.**

2.27.9.4.1 **Occupancy.** Service corridors shall be classified as Group H-5.

2.27.9.4.2 **Use conditions.** Service corridors shall be separated from exit access corridors as required by Section 2.27.9.2.2. Service corridors shall not be used as a required exit access corridor.

2.27.9.4.3 **Mechanical ventilation.** Service corridors shall be mechanically ventilated as required by Section 2.27.9.2.6 or at not less than six air changes per hour, whichever is greater.

2.27.9.4.4 **Means of egress.** The maximum distance of travel from any point in a service corridor to an exit, exit access corridor or door into a fabrication area shall not exceed 23 m. Dead ends shall not exceed 1.22 m in length. There shall be not less than two exits, and not more than one-half of the required means of egress shall require travel into a fabrication area. Doors from service corridors shall swing in the direction of egress travel and shall be self-closing.

2.27.9.4.5 **Minimum width.** The minimum clear width of a service corridor shall be 1.5 m, or 838 mm wider than the widest cart or truck used in the corridor, whichever is greater.

2.27.9.4.6 **Emergency alarm system.** Emergency alarm systems shall be provided in accordance with this section and Sections 2.13.7.1 and 2.13.7.2. The maximum allowable quantity per control area provisions shall not apply to emergency alarm systems required for HPM.

2.27.9.4.6.1 **Service corridors.** An emergency alarm system shall be provided in service corridors, with at least one alarm device in each service corridor.

2.27.9.4.6.2 **Exit access corridors and exit enclosures.** Emergency alarms for exit access corridors and exit enclosures shall comply with Section 2.14.7.2.

2.27.9.4.6.3 **Liquid storage rooms, HPM rooms and gas rooms.** Emergency alarms for liquid storage rooms, HPM rooms and gas rooms shall comply with Section 2.13.7.1.

2.27.9.4.6.4 **Alarm-initiating devices.** An approved emergency telephone system, local alarm manual pull stations, or other approved alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

2.27.9.4.6.5 **Alarm signals.** Activation of the emergency alarm system shall sound a local alarm and transmit a signal to the emergency control station.

2.27.9.5 **Storage of hazardous production materials.**

2.27.9.5.1 **General.** Storage of HPM in fabrication areas shall be within approved or listed storage cabinets or gas cabinets, or within a workstation. The storage of hazardous production materials in quantities greater than those listed in Tables 2.7.7(1) or 2.7.7(2) shall be in liquid storage rooms, HPM rooms or gas rooms as appropriate for the materials stored. The storage of other hazardous materials shall be in accordance with other applicable provisions of this code requirements and this code requirements.

2.27.9.5.2 **Construction.**

2.27.9.5.2.1 **HPM rooms and gas rooms.** HPM rooms and gas rooms shall be separated from other areas by not less than a 2 hours fire barrier where the area is 27.9 m^2 or more and not less than a 1 hour fire barrier where the area is less than 27.9 m^2.

2.27.9.5.2.2 **Liquid storage rooms.** Liquid storage rooms shall be constructed in accordance with the following requirements:

1. Rooms in excess of 46.5 m^2 shall have at least one exterior door approved for fire department access.
2. Rooms shall be separated from other areas by fire barriers having a fire-resistance rating of not less than 1 hour for rooms up to 13.9 m^2 in area and not less than 2 hours where the room is more than 13.9 m^2 in area.
3. Shelving, racks and wainscoting in such areas shall be of noncombustible construction or wood of not less than 25 mm nominal thickness.
4. Rooms used for the storage of Class I flammable liquids shall not be located in a basement.

2.27.9.5.2.3 **Floors.** Except for surfacing, floors of HPM rooms and liquid storage rooms shall be of noncombustible liquid-tight construction. Raised grating over floors shall be of noncombustible materials.

2.27.9.5.3 **Location.** Where HPM rooms, liquid storage rooms and gas rooms are provided, they shall have at least one exterior wall and such wall shall be not less than 9.1 m from property lines, including property lines adjacent to public ways.

2.27.9.5.4 **Explosion control.** Explosion control shall be provided where required by Section 2.14.5.1.

2.27.9.5.5 **Exits.** Where two exits are required from HPM rooms, liquid storage rooms and gas rooms, one shall be directly to the outside of the building.

2.27.9.5.6 **Doors.** Doors in a fire barrier wall, including doors to corridors, shall be self-closing fire assemblies having a fire-protection rating of not less than 3/4 hour.

2.27.9.5.7 **Ventilation.** Mechanical exhaust ventilation shall be provided in liquid storage rooms, HPM rooms and gas rooms at the rate of not less than 0.044 $L/s/m^2$ of floor area or six air changes per hour, whichever is greater, for categories of material. Exhaust ventilation for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding areas and direct the exhaust ventilation to an exhaust system.

2.27.9.5.8 **Emergency alarm system.** An approved emergency alarm system shall be provided for HPM rooms, liquid storage rooms and gas rooms.

1. Emergency alarm-initiating devices shall be installed outside of each interior exit door of such rooms. Activation of an emergency alarm-initiating device shall sound a local alarm and transmit a signal to the emergency control station.
2. An approved emergency telephone system, local alarm manual pull stations or other approved alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

2.27.9.6 **Piping and tubing.**

2.27.9.6.1 **General.** Hazardous production materials piping and tubing shall comply with this section and ANSI B31.3.

2.27.9.6.2 **Supply piping and tubing.**

2.27.9.6.2.1 **HPM having a health-hazard ranking of 3 or 4.** Systems supplying HPM liquids or gases having a health-hazard ranking of 3 or 4 shall be welded throughout, except for connections, to the systems that are within a ventilated enclosure if the material is a gas, or an approved method of drainage or containment is provided for the connections if the material is a liquid.

2.27.9.6.2.2 **Location in service corridors.** Hazardous production materials supply piping or tubing in service corridors shall be exposed to view.

2.27.9.6.2.3 **Excess flow control.** Where HPM gases or liquids are carried in pressurized piping above 103.4 kPa, excess flow control shall be provided. Where the piping originates from within a liquid storage room, HPM room or gas room, the excess flow control shall be located within the liquid storage room, HPM room or gas

room. Where the piping originates from a bulk source, the excess flow control shall be located as close to the bulk source as practical.

2.27.9.6.3 **Installations in exit access corridors and above other occupancies.** The installation of hazardous production material piping and tubing within the space defined by the walls of exit access corridors and the floor or roof above or in concealed spaces above other occupancies shall be in accordance with Section 2.27.9.6.2 and the following conditions:

1. Automatic sprinklers shall be installed within the space unless the space is less than 152 mm in the least dimension.
2. Ventilation not less than six air changes per hour shall be provided. The space shall not be used to convey air from any other area.
3. Where the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an approved location. The 1 hour enclosure shall not be used as part of the receptor.
4. HPM supply piping and tubing and HPM nonmetallic waste lines shall be separated from the exit access corridor and from occupancies other than Group H-5 by construction as required for walls or partitions that have a fire protection rating of not less than 1 hour. Where gypsum wallboard is used, joints on the piping side of the enclosure are not required to be taped, provided the joints occur over framing members. Access openings into the enclosure shall be protected by approved fire-resistance-rated assemblies.
5. Readily accessible manual or automatic remotely activated fail-safe emergency shutoff valves shall be installed on piping and tubing other than waste lines at the following locations:
   5.1 At branch connections into the fabrication area.
   5.2 At entries into exit access corridors.

   Exception: Transverse crossings of the corridors by supply piping that is enclosed within a ferrous pipe or tube for the width of corridor need not comply with Items 1 through 5.

2.27.9.6.4 **Identification.** Piping, tubing and HPM waste lines shall be identified in accordance with ANSI A13.1 to indicate the material being transported.

2.27.9.7 **Continuous gas-detection systems.** A continuous gas-detection system shall be provided for HPM gases when the physiological warning properties of the gas are at a higher level than the accepted permissible exposure limit (PEL) for the gas and for flammable gases in accordance with this section.

2.27.9.7.1 **Where required.** A continuous gas-detection system shall be provided in the areas identified in Sections 2.27.9.7.1.1 through 2.27.9.7.1.4.

2.27.9.7.1.1 **Fabrication areas.** A continuous gas-detection system shall be provided in fabrication areas when gas is used in the fabrication area.

2.27.9.7.1.2 **HPM rooms.** A continuous gas-detection system shall be provided in HPM rooms when gas is used in the room.

2.27.9.7.1.3 **Gas cabinets, exhausted enclosures and gas rooms.** A continuous gas-detection system shall be provided in gas cabinets and exhausted enclosures. A continuous gas-detection system shall be provided in gas rooms when gases are not located in gas cabinets or exhausted enclosures.

2.27.9.7.1.4 **Exit access corridors.** When gases are transported in piping placed within the space defined by the walls of an exit access corridor, and the floor or roof above the exit access corridor, a continuous gas-detection system shall be provided where piping is located and in the exit access corridor.

Exception: A continuous gas-detection system is not required for occasional transverse crossings of the corridors by supply piping that is enclosed in a ferrous

pipe or tube for the width of the corridor.

2.27.9.7.2 **Gas-detection system operation.** The continuous gas-detection system shall be capable of monitoring the room, area or equipment in which the gas is located at or below the PEL or ceiling limit of the gas for which detection is provided. For flammable gases, the monitoring detection threshold level shall be vapor concentrations in excess of 20 percent of the lower explosive limit (LFL). Monitoring for highly toxic and toxic gases shall also comply with the requirements for such material in this code requirements.

2.27.9.7.2.1 **Alarms.** The gas detection system shall initiate a local alarm and transmit a signal to the emergency control station when a short-term hazard condition is detected. The alarm shall be both visual and audible and shall provide warning both inside and outside the area where the gas is detected. The audible alarm shall be distinct from all other alarms.

2.27.9.7.2.2 **Shutoff of gas supply.** The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for which gas is detected when a short-term hazard condition is detected. Automatic closure of shutoff valves shall comply with the following:

1. Where the gas-detection sampling point initiating the gas detection system alarm is within a gas cabinet or exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.
2. Where the gas-detection sampling point initiating the gas detection system alarm is within a room and compressed gas containers are not in gas cabinets or an exhausted enclosure, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas-detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve supplying the manifold for the compressed gas container of the specific gas detected shall automatically close.

Exception: Where the gas-detection sampling point initiating the gas detection system alarm is at the use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve for the branch line located in the piping distribution manifold enclosure shall automatically close.

2.27.9.8 **Manual fire alarm system.** An approved manual fire alarm system shall be provided throughout buildings containing Group H-5. Activation of the alarm system shall initiate a local alarm and transmit a signal to the emergency control station. The fire alarm system shall be designed and installed in accordance with Section 7.7.

2.27.9.9 **Emergency control station.** An emergency control station shall be provided on the premises at an approved location, outside of the fabrication area and shall be continuously staffed by trained personnel. The emergency control station shall receive signals from emergency equipment and alarm and detection systems. Such emergency equipment and alarm and detection systems shall include, but not necessarily be limited to, the following where such equipment or systems are required to be provided either in Section 2.27.9 or elsewhere in this code requirements:

1. Automatic fire sprinkler system alarm and monitoring systems.
2. Manual fire alarm systems.
3. Emergency alarm systems.
4. Continuous gas-detection systems.
5. Smoke detection systems.
6. Emergency power system.

2.27.9.10 **Emergency power system.** An emergency power system shall be provided in Group H-5 occupancies where required in Section 2.27.9.10.1. The emergency power system shall be designed to supply power automatically to required electrical systems when the normal electrical supply system is interrupted.

2.27.9.10.1 **Where required.** Emergency power shall be provided for electrically operated equipment and connected control circuits for the following systems:

1. HPM exhaust ventilation systems.
2. HPM gas cabinet ventilation systems.
3. HPM exhausted enclosure ventilation systems.
4. HPM gas room ventilation systems.
5. HPM gas detection systems.
6. Emergency alarm systems.
7. Manual fire alarm systems.
8. Automatic sprinkler system monitoring and alarm systems.

Electrically operated systems required elsewhere in this code requirements applicable to the use, storage or handling of HPM.

2.27.9.10.2 **Exhaust ventilation systems.** Exhaust ventilation systems are allowed to be designed to operate at not less than one-half the normal fan speed on the emergency power system where it is demonstrated that the level of exhaust will maintain a safe atmosphere.

2.27.9.11 **Fire sprinkler system protection in exhaust ducts for HPM.**

2.27.9.11.1 **General.** Automatic fire sprinkler system protection shall be provided in exhaust ducts conveying vapors, fumes, mists or dusts generated from HPM in accordance with this section and the SBC 501.

2.27.9.11.2 **Metallic and noncombustible, nonmetallic exhaust ducts.** Automatic fire sprinkler system protection shall be provided in metallic and noncombustible, nonmetallic exhaust ducts where all of the following conditions apply:

1. Where the largest cross-sectional diameter is equal to or greater than 254 mm.
2. The ducts are within the building.
3. The ducts are conveying flammable vapors or fumes.

2.27.9.11.3 **Combustible nonmetallic exhaust ducts.** Automatic fire sprinkler system protection shall be provided in combustible nonmetallic exhaust ducts where the largest cross-sectional diameter of the duct is equal to or greater than 254 mm.

Exceptions:

1. Ducts listed or approved for applications without automatic fire sprinkler system protection.
2. Ducts not more than 3.7 m in length installed below ceiling level.

2.27.9.11.4 **Automatic sprinkler locations.** Sprinkler systems shall be installed at 3.7 m intervals in horizontal ducts and at changes in direction. In vertical ducts, sprinklers shall be installed at the top and at alternate floor levels.

SECTION 2.28
APPLICATION OF FLAMMABLE FINISHES

2.28.1 **General.** The provisions of this section shall apply to the construction, installation and use of buildings and structures, or parts thereof, for the spraying of flammable paints, varnishes and lacquers or other flammable materials or mixtures or compounds used for painting, varnishing, staining or similar purposes. Such construction and equipment shall comply with this code requirements.

2.28.2 **Spray rooms.** Spray rooms shall be enclosed with fire barrier walls and horizontal assemblies or both with not less than a 1 hour fire-resistance rating. Floors shall be water-proofed and drained in an approved manner.

2.28.2.1 **Surfaces.** The interior surfaces of spray rooms shall be smooth and shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning, and shall be so designed to confine residues within the room. Aluminum shall not be used.

2.28.3 **Spraying spaces.** Spraying spaces shall be ventilated with an exhaust system to prevent the accumulation of flammable mist or vapors in accordance with the SBC 501. Where such spaces are not separately enclosed, noncombustible spray curtains shall be provided to restrict the spread of flammable vapors.

2.28.3.1 **Surfaces.** The interior surfaces of spraying spaces shall be smooth and continuous without edges, and shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning, and shall be so designed to confine residues within the spraying space. Aluminum shall not be used.

2.28.4 **Fire protection.** An automatic fire-extinguishing system shall be provided in all spray, dip and immersing spaces and storage rooms, and shall be installed in accordance with Chapter 7 of the SBC 801.

SECTION 2.29
DRYING ROOMS

2.29.1 **General.** A drying room or dry kiln installed within a building shall be constructed entirely of approve d noncombustible materials or assemblies of such materials regulated by the approved rules or as required in the general and specific sections of Section 2 of Chapter 2 for special occupancies and where applicable to the general requirements of SBC 501.

2.29.2 **Piping clearance.** Overhead heating pipes shall have a clearance of not less than 51 mm from combustible contents in the dryer.

2.29.3 **Insulation.** Where the operating temperature of the dryer is 79°C or more, metal enclosures shall be insulated from adjacent combustible materials by not less than 305 mm of airspace, or the metal walls shall be lined with 6.35 mm insulating mill board or other approved equivalent insulation.

2.29.4 **Fire protection.** Drying rooms designed for high-hazard materials and processes, including special occupancies as provided for in Section 2 of this Chapter, shall be protected by an approved automatic fire-extinguishing system conforming to the provisions of Chapter 7 of the SBC 801.

SECTION 2.30
ORGANIC COATINGS

2.30.1 **Building features.** Manufacturing of organic coatings shall be done only in buildings that do not have pits or basements.

2.30.2 **Location.** Organic coating manufacturing operations and operations incidental to or connected therewith shall not be located in buildings having other occupancies.

2.30.3 **Process mills.** Mills operating with close clearances and that process flammable and heat-sensitive materials, such as nitrocellulose, shall be located in a detached building or noncombustible structure.

2.30.4 **Tank storage.** Storage areas for flammable and combustible liquid tanks inside of structures shall be located at or above grade and shall be separated from the processing area by not less than 2 hours fire-resistance-rated fire barriers.

2.30.5 **Nitrocellulose storage.** Nitrocellulose storage shall be located on a detached pad or in a separate structure or a room enclosed with no less than 2 hours fire-resistance-rated fire barriers.

2.30.6 **Finished products.** Storage rooms for finished products that are flammable or combustible liquids shall be separated from the processing area by fire barriers having a fire-resistance rating of at least 2 hours, and openings in the walls shall be protected with approved opening protectives.

CHAPTER 3
GENERAL BUILDING HEIGHTS AND AREAS

SECTION 3.1
GENERAL

3.1.1 **Scope.** The provisions of this chapter control the height and area of structures hereafter erected and additions to existing structures.

3.1.2 **Premises identification.** Approved numbers or addresses shall be provided for new buildings in such a position as to be clearly visible and legible from the street or roadway fronting the property. Letters or numbers shall be a minimum 76 mm in height and stroke of minimum 12.7 mm of a contrasting color to the background itself.

SECTIONS 3.2
DEFINITIONS

3.2.1 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

AREA, BUILDING. The area included within surrounding exterior walls (or exterior walls and fire walls) exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

BASEMENT. That portion of a building that is partly or completely below grade plane (See “Story above grade plane” in Chapter 1). A basement shall be considered as a story above grade plane where the finished surface of the floor above the basement is:

1. More than 1.8 m above grade plane;
2. More than 1.8 m above the finished ground level for more than 50 percent of the total building perimeter; or
3. More than 3.7 m above the finished ground level at any point.

GRADE PLANE. A reference plane representing the average of finished ground level adjoining the building at exterior walls. Where the finished ground level slopes away from the exterior walls, the reference plane shall be established by the lowest points within the area between the building and the lot line or, where the lot line is more than 1.8 m from the building, between the building and a point 1.8 m from the building.

HEIGHT, BUILDING. The vertical distance from grade plane to the average height of the highest roof surface.

HEIGHT, STORY. The vertical distance from top to top of two successive finished floor surfaces; and, for the topmost story, from the top of the floor finish to the top of the ceiling joists or, where there is not a ceiling, to the top of the roof rafters.

INDUSTRIAL EQUIPMENT PLATFORM. An unoccupied, elevated platform in an industrial occupancy used exclusively for mechanical systems or industrial process equipment, including the associated elevated walkways, stairs and ladders necessary to access the platform (see Section 3.5.5).

MEZZANINE. An intermediate level or levels between the floor and ceiling of any story with an aggregate floor area of not more than one-third of the area of the room or space in which the level or levels are located (see Section 3.5).

STORY. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above (also see “Basement” and “Mezzanine”).

SECTION 3.3
GENERAL HEIGHT AND AREA LIMITATIONS

3.3.1 **General.** The height and area for buildings of different construction types shall be governed by the intended use of the building and shall not exceed the limits in Table 3.3 except as modified hereafter. Each part of a building included within the exterior walls or the exterior walls and fire walls where provided shall be permitted to be a separate building.

3.3.1.1 **Basements.** Basements need not be included in the total allowable area provided they do not exceed the area permitted for a one-story building.

3.3.1.2 **Special industrial occupancies.** Buildings and structures designed to house low-hazard industrial processes that require large areas and unusual heights to accommodate crane ways or special machinery and equipment including, among others, rolling mills; structural metal fabrication shops and foundries; or the production and distribution of electric, gas or steam power, shall be exempt from the height and area limitations of Table 3.3.

3.3.1.3 **Buildings on same lot.** Two or more buildings on the same lot shall be regulated as separate buildings or shall be considered as portions of one building if the height of each building and the aggregate area of buildings are within the limitations of Table 3.3 as modified by Sections 3.4 and 3.6. The provisions of this code applicable to the aggregate building shall be applicable to each building.

3.3.1.4 **Type I construction.** Buildings of Type I construction permitted to be of unlimited tabular heights and areas are not subject to the special requirements that allow unlimited area buildings in Section 3.7 or unlimited height in Sections 3.3.1.2 and 3.4.3 or increased height and areas for other types of construction.

3.3.2 **Party walls.** Any wall located on a property line between adjacent buildings, which is used or adapted for joint service between the two buildings, shall be constructed as a fire wall in accordance with Section 4B.6, without openings and shall create separate buildings.

SECTION 3.4
HEIGHT MODIFICATIONS

3.4.1 **General.** The heights permitted by Table 3.3 shall only be increased in accordance with this section.

Exception: The height of one-story aircraft hangars, aircraft paint hangars and buildings used for the manufacturing of aircraft shall not be limited if the building is provided with an automatic fire-extinguishing system in accordance with Chapter 7 and is entirely surrounded by public ways or yards not less in width than one and one-half times the height of the building.

TABLE 3.3
ALLOWABLE HEIGHT AND BUILDING AREAS
Height limitations shown as stories and meters above grade plane.
Area limitations as determined by the definition of "Area, building," per floor.

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
GROUP	Hgt(m) Hgt(S)	UL	160	65	55	65	55	65	50	40
A-1	S	UL	5	3	2	3	2	3	2	1
	A	UL	UL	4,724	2,591	4,267	2,591	4,572	3,505	1,676
A-2	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	4,724	2,896	4,267	2,896	4,572	3,505	1,829
A-3	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	4,724	2,896	4,267	2,896	4,572	3,505	1,829
A-4	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	4,724	2,896	4,267	2,896	4,572	3,505	1,829
A-5	S	UL	UL	UL	UL	UL	UL	UL	UL	UL
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	S	UL	11	5	4	5	4	5	3	2
	A	UL	UL	11,430	7,010	8,687	5,791	10,973	5,486	2,743
E	S	UL	5	3	2	3	2	3	1	1
	A	UL	UL	8,077	4,420	7,163	4,420	7,772	5,639	2,896
F-1	S	UL	11	4	2	3	2	4	2	1
	A	UL	UL	7,620	4,724	5,791	3,658	10,211	4,267	2,591
F-2	S	UL	11	5	3	4	3	5	3	2
	A	UL	UL	11,278	7,010	8,687	5,486	24,536	6,401	3,962
H-1	S	I	1	1	1	1	1	1	1	NP
	A	1951	5,029	3,353	2,134	2,896	2,134	3,200	2,286	NP
H-2	S	UL	3	2	1	2	1	2	1	1
	A	1951	5,029	3,353	2,134	2,896	2,134	3,200	2,286	914
H-3	S	UL	6	4	2	4	2	4	2	1
	A	UL	18,288	8,077	4,267	5,334	3,962	7,772	3,048	1,524
H-4	S	UL	7	5	3	5	3	5	3	2
	A	UL	UL	11,430	5,334	8,687	5,334	10,973	5,486	1,981
H-5	S	3	3	3	3	3	3	3	3	2
	A	UL	UL	11,430	7,010	8,687	5,791	10,973	5,486	2,743
I-1	S	UL	9	4	3	4	3	4	3	2
	A	UL	16,764	5,791	3,048	5,029	3,048	5,486	3,200	1,372
I-2	S	UL	4	2	1	1	NP	1	1	NP
	A	UL	UL	4,572	3,353	3,658	NP	3,658	2,896	NP
I-3	S	UL	4	2	1	2	1	2	2	1
	A	UL	UL	4,572	3,353	3,200	2,286	3,658	2,286	1,524
I-4	S	UL	5	3	2	3	2	3	1	1
	A	UL	18,440	8,077	3,962	7,163	3,962	7,772	5,639	2,743
M	S	UL	11	4	4	4	4	4	3	1
	A	UL	UL	6,553	3,810	5,639	3,810	6,248	4,267	2,743
R-1	S	UL	11	4	4	4	4	4	3	2
	A	UL	UL	7,315	4,877	7,315	4,877	6,248	3,658	2,134
R-2[a]	S	UL	11	4	4	4	4	4	3	2
	A	UL	UL	7,315	4,877	7,315	4,877	6,248	3,658	2,134
R-3[a]	S	UL	11	4	4	4	4	4	3	3
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL
R-4	S	UL	11	4	4	4	4	4	3	2
	A	UL	UL	7,315	4,877	7,315	4,877	6,248	3,658	2,134
S-1	S	UL	11	4	3	3	3	4	3	1
	A	UL	14,630	7,925	5,334	7,925	5,334	7,772	4,267	2,743
S-2[b-c]	S	UL	11	5	4	4	4	5	4	2
	A	UL	24,079	11,887	7,925	11,887	7,925	11,735	6,401	4,115
U[c]	S	UL	5	4	2	3	2	4	2	1
	A	UL	10,820	5,791	2,591	4,267	2,591	5,486	2,743	1,676

UL = Unlimited, NP = Not permitted, a = As applicable in SBC 100, b.= For open parking structures, see Section 2B.6.3.; and c.= For private garages, see Section 2B.6.1.

3.4.2 **Automatic sprinkler system increase.** Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 7.3.3.1.1, the value specified in Table 3.3 for maximum height is increased by 6.1 m and the

maximum number of stories is increased by one story. These increases are permitted in addition to the area increase in accordance with Sections 3.6.2 and 3.6.3. For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 7.3.3.1.2, the value specified in Table 3.3 for maximum height is increased by 6.1 m and the maximum number of stories is increased by one story, but shall not exceed four stories or 18.3 m, respectively.

Exceptions:

1. Group I-2 of Type IIB, III, IV or V construction.
2. Group H-1, H-2, H-3 or H-5.
3. Fire-resistance rating substitution in accordance with Table 4A.1 (FR Rated Requirements for Building Elements).

3.4.3 **Roof structures.** Towers, spires, steeples and other roof structures shall be constructed of materials consistent with the required type of construction of the building except where other construction is permitted by Section 6.9.2.1 of SBC 201 Such structures shall not be used for habitation or storage. The structures shall be unlimited in height if of noncombustible materials and shall not extend more than 6.1 m above the allowable height if of combustible materials (see Chapter 6 for additional requirements).

SECTION 3.5
MEZZANINES

3.5.1 **General.** A mezzanine or mezzanines in compliance with this section shall be considered a portion of the floor below. Such mezzanines shall not contribute to either the building area or number of stories as regulated by Section 3.3.1. The area of the mezzanine shall be included in determining the fire area defined in Section 4A.2. The clear height above and below the mezzanine floor construction shall not be less than 2.1 m.

3.5.2 **Area limitation.** The aggregate area of a mezzanine or mezzanines within a room shall not exceed one-third of the area of that room or space in which they are located. The enclosed portions of rooms shall not be included in a determination of the size of the room in which the mezzanine is located. In determining the allowable mezzanine area, the area of the mezzanine shall not be included in the area of the room.

Exception: The aggregate area of mezzanines in buildings and structures of Type I or II construction for special industrial occupancies in accordance with Section 3.3.1.2 shall not exceed two-thirds of the area of the room.

3.5.3 **Egress.** Each occupant of a mezzanine shall have access to at least two independent means of egress where the common path of egress travel exceeds the limitations of Section 8.4.2.5. Where a stairway provides a means of exit access from a mezzanine, the maximum travel distance includes the distance traveled on the stairway measured in the plane of the tread nosing.

Exceptions:

1. A single means of egress shall be permitted in accordance with Section 8.4.2.1.
2. Accessible means of egress shall be provided in accordance with Section 8.3.2.13.

3.5.4 **Openness.** A mezzanine shall be open and unobstructed to the room in which such mezzanine is located except for walls not more than 1067 mm high, columns and posts.

Exceptions:

1. Mezzanines or portions thereof are not required to be open to the room in which the mezzanines are located, provided that the occupant load of the aggregate area of the enclosed space does not exceed 10 add units.
2. A mezzanine having two or more means of egress is not required to be open to the room in which the mezzanine is located, if at least one of the means of egress provides direct access to an exit from the mezzanine level.
3. Mezzanines or portions thereof are not required to be open to the room in which the mezzanines are located, provided that the aggregate floor area of the enclosed space does not exceed 10 percent of the mezzanine area.
4. In industrial facilities, mezzanines used for control equipment are permitted to be glazed on all sides.
5. In Group F occupancies of unlimited area, meeting the requirements of Section 3.7.2 or 3.7.3, mezzanines or portions thereof are not required to be open to the room in which the mezzanines are located, provided that an approved fire alarm system is installed throughout the entire building or structure and notification appliances are installed throughout the mezzanines in accordance with the provisions of NFPA 72. In addition, the fire alarm system shall be initiated by automatic sprinkler water flow.

3.5.5 **Industrial equipment platforms.** Industrial equipment platforms in buildings shall not be considered as a portion of the floor below. Such equipment platforms shall not contribute to either the building area or the number of stories as regulated by Section 3.3.1. The area of the industrial equipment platform shall not be included in determining the fire area. Industrial equipment platforms shall not be a part of any mezzanine, and such platforms and the walkways, stairs and ladders providing access to an equipment platform shall not serve as a part of the means of egress from the building.

3.5.5.1 **Area limitations.** The aggregate area of all industrial equipment platforms within a room shall not exceed two-thirds of the area of the room in which they occur. Where an equipment platform is located in the same room as a mezzanine, the area of the mezzanine shall be determined by Section 3.5.2, and the combined aggregate area of the equipment platforms and mezzanines shall not exceed two-thirds of the room in which they occur.

3.5.5.2 **Fire suppression.** Where located in a building that is required to be protected by an automatic sprinkler system, industrial equipment platforms shall be fully protected by sprinklers above and below the platform, where required by the standards referenced in Section 7.3.3.

3.5.5.3 **Guards.** Equipment platforms shall have guards where required by Section 8.12.1.

SECTION 3.6
AREA MODIFICATIONS

3.6.1 **General.** The areas limited by Table 3.3 shall be permitted to be increased due to frontage (I_f) and automatic sprinkler system protection (I_s) in accordance with the following:

$$A_a = A_t + \left[\frac{A_t I_f}{100}\right] + \left[\frac{A_t I_s}{100}\right]$$ (Equation 3-1)

where:

A_a = Allowable area per floor (square meters).

A_t = Tabular area per floor in accordance with Table 3.3 (square meters).

I_f = Area increase due to frontage (percent) as calculated in accordance with Section 3.6.2.

I_s = Area increase due to sprinkler protection (percent) as calculated in accordance with Section 3.6.3.

3.6.1.1 **Basements.** A single basement need not be included in the total allowable area provided such basement does not exceed the area permitted for a one-story building.

3.6.2 **Frontage increase.** Every building shall adjoin or have access to a public way to receive an area increase for frontage. Where a building has more than 25 percent of its perimeter on a public way or open space having a minimum width of 6.1 m, the frontage increase shall be determined in accordance with the following:

$$I_f = 100\left[\frac{F}{P} - 0.25\right]\frac{W}{30}$$ (Equation 3-2)

where:

I_f = Area increase due to frontage.

F = Building perimeter which fronts on a public way or open space having 6.1 m open minimum width (meters).

P = Perimeter of entire building (meters).

W = Width of public way or open space (meters) in accordance with Section 3.6.2.1.

3.6.2.1 **Width limits.** *W* must be at least 6.1 m and the quantity *W* divided by 30 shall not exceed 1.0 where the value of *W* varies along the perimeter of the building, the calculation performed in accordance with Equation 3-2 shall be based on the weighted average of each portion of exterior wall and open space where the value of W is between 6.1 and 9.1 m.

Exception: The quantity W divided by 30 shall be permitted to not exceed 2.0 when all of the following conditions exist:

1. The building is permitted to be unlimited in area by Section 3.7; and
2. The only provision preventing unlimited area is compliance with the 18.3 m public way or yard requirement, as applicable.

3.6.2.2 **Open space limits**. Such open space shall be either on the same lot or dedicated for public use and shall be accessed from a street or approved fire lane.

3.6.3 **Automatic sprinkler system increase.** Where a building is protected throughout with an approved automatic sprinkler system in accordance with Section 7.3.3.1.1, the area limitation in Table 3.3 is permitted to be increased by an additional 200 percent (I_s=200 percent) for multistory buildings and an additional 300 percent (I_s=300 percent) for single-story buildings. These increases are permitted in addition to the height and story increases in accordance with Section 3.4.2.

Exceptions:

1. Buildings with an occupancy in Group H-1, H-2 or H-3.
2. Fire-resistance rating substitution in accordance with Table 4A.1, Note d.

3.6.4 **Area determination.** The maximum area of a building with more than one story shall be determined by multiplying the allowable area of the first floor (A_a), as determined in Section 3.6.1, by the number of stories as listed below.

1. For two-story buildings, multiply by 2;
2. For three-story or higher buildings, multiply by 3; and,
3. No story shall exceed the allowable area per floor (A_a), as determined in Section 3.6.1 for the occupancies on that floor.

Exceptions:

1. Unlimited area buildings in accordance with Section 3.7.
2. The maximum area of a building equipped with an automatic sprinkler system in accordance with Section 7.3.3.1.2 shall be determined by multiplying the allowable area per floor (A_a), as determined in Section 3.6.1 by the number of stories.

SECTION 3.7
UNLIMITED AREA BUILDINGS

3.7.1 **Non-sprinklered, one story.** The area of a one-story, Group F-2 or S-2 building shall not be limited when the building is surrounded and adjoined by public ways or yards not less than 18.3 m in width.

3.7.2 **Sprinklered, one story.** The area of a one-story, Group B, F, M or S building or a one-story Group A-4 building of other than Type V construction shall not be limited when the building is provided with an automatic sprinkler system throughout in accordance with Section 7.3.3.1.1, and is surrounded and adjoined by public ways or yards not less than 18.3 m in width.

Exceptions:

1. Buildings and structures of Type I and II construction for rack storage facilities which do not have access by the public shall not be limited in height provided that such buildings conform to the requirements of Section 3.7.1 and NFPA 231C.
2. The automatic sprinkler system shall not be required in areas occupied for indoor participant sports, such as tennis, skating, swimming and equestrian activities, in occupancies in Group A-4, provided that:
   2.1 Exit doors directly to the outside are provided for occupants of the participant sports areas, and
   2.2 The building is equipped with a fire alarm system with manual fire alarm boxes installed in accordance with Section 7.7.

3.7.3 **Two story.** The area of a two-story, Group B, F, M or S building shall not be limited when the building is provided with an automatic sprinkler system in accordance with Section 7.3.3.1.1 throughout, and is surrounded and adjoined by public ways or yards not less than 18.3 m in width.

3.7.4 **Reduced open space.** The permanent open space of 18.3 m required in Sections 3.7.1, 3.7.2 and 3.7.3 shall be permitted to be reduced to not less than 12.2 m

provided the following requirements are met:

1. The reduced open space shall not be allowed for more than 75 percent of the perimeter of the building.
2. The exterior wall facing the reduced open space shall have a minimum fire-resistance rating of 3 hours.
3. Openings in the exterior wall, facing the reduced open space, shall have opening protectives with a fire-resistance rating of 3 hours.

3.7.5 **Group A-3 buildings.** The area of a one-story, Group A-3 building used as a prayer hall, community hall, exhibition hall, gymnasium, lecture hall, indoor swimming pool or tennis court of Type I or II construction shall not be limited when all of the following criteria are met:

1. The building shall not have a stage other than a platform.
2. The building shall be equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1.
3. The assembly floor shall be located at or within 533 mm of street or grade level and all exits are provided with ramps complying with Section 8.10.1 to the street or grade level.
4. The building shall be surrounded and adjoined by public ways or yards not less than 18.3 m in width.

3.7.6 **High-hazard use groups.** Group H-2, H-3 and H-4 fire areas shall be permitted in unlimited area buildings having occupancies in Groups F and S, in accordance with the limitations of this section. Fire areas located at the perimeter of the unlimited area building shall not exceed 10 percent of the area of the building nor the area limitations specified in Table 3.3 as modified by Section 3.6.2, based upon the percentage of the perimeter of the fire area that fronts on a street or other unoccupied space. Other fire areas shall not exceed 25 percent of the area limitations specified in Table 3.3. Fire-resistance-rating requirements of fire barrier assemblies shall be in accordance with Table 2A.2.3.3.

3.7.7 **Aircraft paint hangar.** The area of a one-story, Group H-2 aircraft paint hangar shall not be limited where such aircraft paint hangar complies with the provisions of Section 2B.12.4 and is entirely surrounded by public ways or yards not less in width than one and one-half times the height of the building.

3.7.8 **Group E buildings.** The area of a one-story Group E building of Type II, IIIA or IV construction shall not be limited when the following criteria are met:

1. Each classroom shall have not less than two means of egress, with one of the means of egress being a direct exit to the outside of the building complying with Section 8.17.
2. The building is equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3.1.1.
3. The building is surrounded and adjoined by public ways or yards not less than 18.3 m in width.

3.7.9 **Motion picture theaters.** In buildings of Type I or II construction, the area of one-story motion picture theaters shall not be limited when the building is provided with an automatic sprinkler system throughout in accordance with Section 7.3.3.1.1 and is surrounded and adjoined by public ways or yards not less

than 18.3 m in width.

SECTION 3.8
SPECIAL PROVISIONS

3.8.1 **General.** The provisions in this section shall permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable heights and areas of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in this section for such condition and other applicable requirements of this code.

3.8.2 **Group S-2 enclosed parking garage with Group A, B, M or R above.** A basement and/or the first story above grade plane of a building shall be considered as a separate and distinct building for the purpose of determining area limitations, continuity of fire walls, limitation of number of stories and type of construction, when all of the following conditions are met:

1. The basement and/or the first story above grade plane is of Type IA construction and is separated from the building above with a horizontal assembly having a minimum 3 hours fire-resistance rating.

2. Shaft, stairway, ramp or escalator enclosures through the horizontal assembly shall have not less than a 2-hour fire-resistance rating with opening protectives in accordance with Table 4B.16.3.

Exception: Where the enclosure walls below the horizontal assembly have not less than a 3 hours fire-resistance rating with opening protectives in accordance with Table 4B.16.3 (Fire Door & Fire Shutter Fire Protection Ratings), the enclosure walls extending above the horizontal assembly shall be permitted to have a 1-hour fire-resistance rating provided:

1. The building above the horizontal assembly is not required to be of Type I construction;
2. The enclosure connects less than four stories, and
3. The enclosure opening protectives above the horizontal assembly have a minimum 1-hour fire protection rating.

3. The building above the horizontal assembly contains only Group A having an assembly room with an occupant load of less than 300, or Group B, M or R; and

4. The building below the horizontal assembly is a Group S-2 enclosed parking garage, used for the parking and storage of private motor vehicles.

Exceptions:

1. Entry lobbies, mechanical rooms and similar uses incidental to the operation of the building shall be permitted.
2. Group A having an assembly room with an occupant load of less than 300, or Group B or M shall be permitted in addition to those uses incidental to the operation of the building (including storage areas), provided that the entire structure below the horizontal assembly is protected throughout by an approved automatic sprinkler system.

5. The maximum building height in feet shall not exceed the limits set forth in Table 3.3 for the least restrictive type of construction involved.

3.8.3 **Group S-2 enclosed parking garage with Group S-2 open parking garage above.** A Group S-2 enclosed parking garage located in the basement or first story below a Group S-2 open parking garage shall be classified as a separate and distinct building for the purpose of determining the type of construction when the following conditions are met:

1. The allowable area of the structure shall be such that the sum of the ratios of the actual area divided by the allowable area for each separate occupancy shall not exceed 1.0.
2. The Group S-2 enclosed parking garage is of Type I or II construction and is at least equal to the fire-resistance requirements of the Group S-2 open parking garage.
3. The height and the number of the floors above the basement shall be limited as specified in Table 2B.6.3.5 (Open Parking Garages Area & Height).
4. The floor assembly separating the Group S-2 enclosed parking garage and Group S-2 open parking garage shall be protected as required for the floor assembly of the Group S-2 enclosed parking garage. Openings between the Group S-2 enclosed parking garage and Group S-2 open parking garage, except exit openings, shall not be required to be protected.
5. The Group S-2 enclosed parking garage is used exclusively for the parking or storage of private motor vehicles, but shall be permitted to contain an office, waiting room and toilet room having a total area of not more than 93 m^2, and mechanical equipment rooms incidental to the operation of the building.

3.8.4 **Parking beneath Group R.** Where a maximum one-story above grade plane Group S-2 parking garage, enclosed or open, or combination thereof, of Type I construction or open of Type IV construction, with grade entrance, is provided under a building of Group R, the number of stories to be used in determining the minimum type of construction shall be measured from the floor above such a parking area. The floor assembly between the parking garage and the Group R above shall comply with the type of construction required for the parking garage and shall also provide a fire-resistance rating not less than the mixed occupancy separation required in Section 2A.2.3.3.

3.8.5 **Group R-2 buildings of Type IIIA construction.** The height limitation for buildings of Type IIIA construction in Group R-2 shall be increased to six stories and 23 m where the first-floor construction above the basement has a fire-resistance rating of not less than 3 hours and the floor area is subdivided by 2-hour fire-resistance-rated fire walls into areas of not more than 279 m^2.

3.8.6 **Group R-2 buildings of Type IIA construction.** The height limitation for buildings of Type IIA construction in Group R-2 shall be increased to nine stories and 30.5 m where the building is separated by not less than 15.3 m from any other building on the lot and from property lines, the exits are segregated in an area enclosed by a 2-hour fire-resistance-rated fire wall and the first-floor construction has a fire-resistance rating of not less than 11/2 hours.

3.8.7 **Open parking garage beneath Groups A, I, B, M and R.** Open parking garages constructed under Groups A, I, B, M and R shall not exceed the height and area limitations permitted under Section 2B.6.3. The height and area of the portion of the building above the open parking garage shall not exceed the limitations in

Section 3.3 for the upper occupancy. The height, in both feet and stories, of the portion of the building above the open parking garage shall be measured from grade plane and shall include both the open parking garage and the portion of the building above the parking garage.

3.8.7.1 **Fire separation.** Fire separation assemblies between the parking occupancy and the upper occupancy shall correspond to the required fire-resistance rating prescribed in Table 2A.2.3.3 for the uses involved. The type of construction shall apply to each occupancy individually, except that structural members, including main bracing within the open parking structure, which is necessary to support the upper occupancy, shall be protected with the more restrictive fire-resistance-rated assemblies of the groups involved as shown in Table 4A.1. Means of egress for the upper occupancy shall conform to Chapter 8 and shall be separated from the parking occupancy by fire barriers having at least a 2 hour fire-resistance rating as required by Section 4B.7, with self-closing doors complying with Section 4B.16. Means of egress from the open parking garage shall comply with Section 2B.6.3.

CHAPTER 4
TYPES OF CONSTRUCTION

SECTION 4.1
GENERAL

4.1.1 **Scope.** The provisions of this chapter shall control the classification of buildings as to type of construction.

SECTION 4.2
CONSTRUCTION CLASSIFICATION

4.2.1 **General.** Buildings and structures erected or to be erected, altered or extended in height or area shall be classified in one of the five construction types defined in Sections 4.2.2 through 4.2.5. The building elements shall have a fire-resistance rating not less than that specified in Table 4.1 and exterior walls shall have a fire-resistance rating not less than that specified in Table 4.2.

4.2.1.1 **Minimum requirements.** A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type, which meets the minimum requirements based on occupancy even though certain features of such a building actually conform to a higher type of construction.

4.2.2 **Types I and II.** Type I and II construction are those types of construction in which the building elements listed in Table 4.1 are of noncombustible materials.

4.2.3 **Type III.** Type III construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code requirements. Fire-retardant-treated wood framing shall be permitted within exterior wall assemblies of a 2 hours rating or less.

4.2.4 **Type IV.** Type IV construction (Heavy Timber, HT) is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid or laminated wood without concealed spaces. The details of Type IV construction shall comply with the provisions of this section. Fire-retardant-treated wood framing shall be permitted within exterior wall assemblies with a 2 hours rating or less.

4.2.4.1 **Columns.** Wood columns shall be sawn or glued laminated and shall not be less than 200 mm, nominal, in any dimension where supporting floor loads and not less than 150 mm nominal in width and not less than 200 mm nominal in depth where supporting roof and ceiling loads only. Columns shall be continuous or superimposed and connected in an approved manner.

4.2.4.2 **Floor framing.** Wood beams and girders shall be of sawn or glued-laminated timber and shall be not less than 150 mm nominal in width and not less than 254 mm nominal in depth. Framed sawn or glued-laminated timber arches, which spring from the floor line and support floor loads, shall be not less than 200 mm nominal in any dimension. Framed timber trusses supporting floor loads shall have members of not less than 200 mm nominal in any dimension.

4.2.4.3 **Roof framing.** Wood-frame or glued-laminated arches for roof construction, which spring from the floor line or from grade and do not support floor loads, shall have members not less than 150 mm nominal in width and have less than 200 mm nominal in depth for the lower half of the height and not less than 150 mm nominal in depth for the upper half. Framed or glued laminated arches for roof

construction that spring from the top of walls or wall abutments, framed timber trusses and other roof framing, which do not support floor loads, shall have members not less than 100 mm nominal in width and not less than 150 mm nominal in depth. Spaced members shall be permitted to be composed of two or more pieces not less than 76 mm nominal in thickness where blocked solidly throughout their intervening spaces or where spaces are tightly closed by a continuous wood cover plate of not less than 50 mm nominal in thickness secured to the underside of the members. Splice plates shall be not less than 76 mm nominal in thickness. Where protected by approved automatic sprinklers under the roof deck, framing members shall be not less than 76 mm nominal in width.

4.2.4.4 **Floors.** Floors shall be without concealed spaces. Wood floors shall be of sawn or glued-laminated planks, splined or tongue-and-groove, of not less than 76 mm nominal in thickness covered with 25 mm nominal dimension tongue-and-groove flooring, laid crosswise or diagonally, or 12.7 mm particleboard or planks not less than 100 mm nominal in width set on edge close together and well spiked and covered with 25 mm nominal dimension flooring or 12 mm wood structural panel or 12.7 mm particleboard. The lumber shall be laid so that no continuous line of joints will occur except at points of support. Floors shall not extend closer than 12.7 mm to walls. Such 12.7 mm space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor. Corbeling of masonry walls under the floor shall be permitted to be used in place of molding.

4.2.4.5 **Roofs.** Roofs shall be without concealed spaces and wood roof decks shall be sawn or glued laminated, splined or tongue-and-groove plank, not less than 51 mm thick, 32 mm wood structural panel (exterior glue), or of planks not less than 76 mm nominal in width, set on edge close together and laid as required for floors. Other types of decking shall be permitted to be used if providing equivalent fire resistance and structural properties.

4.2.4.6 **Partitions.** Partitions shall be of solid wood construction formed by not less than two layers of 25 mm matched boards or laminated construction 100 mm thick, or of 1-hour fire-resistance-rated construction.

4.2.4.7 **Exterior structural members.** Where a horizontal separation of 6.1 m or more is provided, wood columns and arches conforming to heavy timber sizes shall be permitted to be used externally.

4.2.5 **Type V.** Type V construction is that type of construction in which the structural elements, exterior walls and interior walls are of any materials permitted by this code requirements.

SECTION 4.3
COMBUSTIBLE MATERIAL IN TYPE I AND II CONSTRUCTION

4.3.1 **Allowable materials.** Combustible materials shall be permitted in buildings of Type I or II construction in the following applications and in accordance with Sections 4.3.1.1 through 4.3.1.3:

1. Fire-retardant-treated wood shall be permitted in:
   - 1.1 Nonbearing partitions where the required fire-resistance rating is 2 hours or less.
   - 1.2 Nonbearing exterior walls where no fire rating is required.
   - 1.3 Roof construction as permitted in Table 4.1, Note c, Item 3.

2. Thermal and acoustical insulation, other than foam plastics, having a flame spread index of not more than 25.

Exceptions:

1. Insulation placed between two layers of noncombustible materials without an intervening airspace shall be allowed to have a flame spread index of not more than 100.
2. Insulation installed between a finished floor and solid decking without intervening airspace shall be allowed to have a flame spread index of not more than 200.

3. Foam plastics in accordance with Chapter 11 of SBC 201.

4. Roof coverings that have an A, B or C classification.

5. Interior floor finish and interior finish, trim and millwork such as doors, door frames, window sashes and frames.

6. Where not installed over 4.6 m above grade, show windows, nailing or furring strips, wooden bulkheads below show windows, their frames, aprons and show cases.

7. Finished flooring applied directly to the floor slab or to wood sleepers that are firestopped in accordance with Chapter 4 of SBC 801.

8. Partitions dividing portions of stores, offices or similar places occupied by one tenant only and which do not establish a corridor serving an occupant load of 30 or more shall be permitted to be constructed of fire-retardant-treated wood, 1-hour fire-resistance-rated construction or of wood panels or similar light construction up to 1.83 m in height.

9. Platforms as permitted in Section 2B.10.

10. Combustible exterior wall coverings, balconies, bay or oriel windows, or similar appendages in accordance with Chapter 5 of SBC 201.

11. Blocking such as for handrails, millwork, cabinets, and window and door frames.

12. Light-transmitting plastics as permitted by Chapter 11 of SBC 201.

13. Mastics and caulking materials applied to provide flexible seals between components of exterior wall construction.

14. Exterior plastic veneer installed in accordance with Section 11.5.2 of SBC 201.

15. Nailing or furring strips as permitted by Section 6.3.3.

16. Heavy timber as permitted by Note c, Item 2, of Table 4.1, Sections 4.2.4.7 and 5.6 of SBC 201. Aggregates, component materials and admixtures as permitted by Chapter 4 of SBC 801.

17. Sprayed cementitious and mineral fiber fire-resistance-rated materials installed to comply with SBC 302.

18. Materials used to protect penetrations in fire-resistance-rated assemblies in accordance with Chapter 4 of SBC 801.

19. Materials used to protect joints in fire-resistance-rated assemblies in accordance with Chapter 4 of SBC 801.

20. Materials allowed in the concealed spaces of buildings of Type I and II construction in accordance with Chapter 4 of SBC 801.

21. Materials exposed within plenums complying with Section 4.2 of SBC 201.

4.3.1.1 **Ducts.** The use of nonmetallic ducts shall be permitted when installed in accordance with the limitations of the SBC 501.

4.3.1.2 **Piping.** The use of combustible piping materials shall be permitted when installed in accordance with the limitations of the SBC 501 and the SBC 701.

4.3.1.3 **Electrical.** The use of electrical wiring methods with combustible insulation, tubing, raceways and related components shall be permitted when installed in accordance with the limitations of the SBC 401.

TABLE 4.1
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A[d]	B	A[d]	B	HT	A[d]	B
Structural frame[a] Including columns, girders, trusses	3[b]	2[b]	1	0	1	0	HT	1	0
Bearing walls Exterior[f] Interior	 3 3[b]	 2 2[b]	 1 1	 0 0	 2 1	 2 0	 2 1/HT	 1 1	 0 0
Nonbearing walls and partitions Exterior	See Table 4.2								
Nonbearing walls and partitions Interior[e]	0	0	0	0	0	0	See Section 4.2.4.6	0	0
Floor construction Including supporting beams and joists	2	2	1	0	1	0	HT	1	0
Roof construction Including supporting beams and joists	11/2[c]	1[c]	1[c]	0	1[c]	0	HT	1[c]	0

a. The structural frame shall be considered to be the columns and the girders, beams, trusses and spandrels having direct connections to the columns and bracing members designed to carry gravity loads. The members of floor or roof panels which have no connection to the columns shall be considered secondary members and not a part of the structural frame.

b. Roof supports: Fire-resistance ratings of structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.

c. 1. Except in Factory-Industrial (F-1), Hazardous (H), Mercantile (M) and Moderate-Hazard Storage (S-1) occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 6.1 m or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
   2. In all occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.
   3. In Type I and II construction, fire-retardant-treated wood shall be allowed in buildings including girders and trusses as part of the roof construction when the building is:
      i. Two stories or less in height;
      ii. Type II construction over two stories; or
      iii. Type I construction over two stories and the vertical distance from the upper floor to the roof is 6.1 m or more.

d. An approved automatic sprinkler system in accordance with Section 7.3.3.1.1 shall be allowed to be substituted for 1-hour fire-resistance-rated construction, provided such system is not otherwise required by other provisions of the code or used for an allowable area increase in accordance with Section 3.6.3 or an allowable height increase in accordance with Section 3.4.2. The 1-hour substitution for the fire resistance of exterior walls shall not be permitted.

e. Not less than the fire-resistance rating required by other sections of this code requirements.

f. Not less than the fire-resistance rating based on fire separation distance (see Table 4.2).

TABLE 4.2
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a]

FIRE SEPARATION DISTANCE (meters)	TYPE OF CONSTRUCTION	GROUP H	GROUP F-1, M, S-1	GROUP A, B, E, F-2, I, R[b], S-2, U
< 1.5[c]	All	3	2	1
≥ 1.5 < 3.1	IA Others	3 2	2 1	1 1
≥ 3.1 < 9.1	IA, IB IIB, VB Others	2 1 1	1 0 1	1 0 1
≥ 9.1	All	0	0	0

a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 4.1.

b. Group R-3 and Group U when used as accessory to Group R-3, as applicable in SBC 100 shall not be required to have a fire-resistance rating where the fire separation distance is 0.9 m or more.

c. See Section 3.3.2 for party walls.

SECTION 4.4
SPECIAL CONSTRUCTION

4.4.1 General

4.4.1.1 Scope. The provisions of this chapter shall govern special building construction including membrane structures, temporary structures, pedestrian walkways and tunnels, awnings and canopies, marquees, signs, and towers and antennas.

4.4.2 Membrane Structures

4.4.2.1 General. The provisions of this section shall apply to air-supported, air-inflated, membrane-covered cable and membrane-covered frame structures, collectively known as membrane structures, erected for a period of 180 days or longer. Those erected for a shorter period of time shall comply with SBC 801. Membrane structures covering water storage facilities, water clarifiers, water treatment plants, sewage treatment plants, greenhouses and similar facilities not used for human occupancy, are required to meet only the requirements of Sections 4.4.2.3.1 and 4.4.2.7.

4.4.2.2 Definitions. The following words and terms shall, for the purposes of this section and as used elsewhere in this code requirements, have the meanings shown herein:

AIR-INFLATED STRUCTURE. A building where the shape of the structure is maintained by air pressurization of cells or tubes to form a barrel vault over the usable area. Occupants of such a structure do not occupy the pressurized area used to support the structure.

AIR-SUPPORTED STRUCTURE. A building wherein the shape of the structure is attained by air pressure and occupants of the structure are within the elevated pressure area. Air-supported structures are of two basic types:

Double skin. Similar to a single skin, but with an attached liner that is separated from the outer skin and provides an airspace which serves for insulation, acoustic, aesthetic or similar purposes.

Single skin. Where there is only the single outer skin and the air pressure is directly against that skin.

CABLE-RESTRAINED AIR-SUPPORTED STRUCTURE. A structure in which the uplift is resisted by cables or webbings which are anchored to either foundations or dead men. Reinforcing cable or webbing is attached by various methods to the membrane or is an integral part of the membrane. This is not a cable-supported structure.

MEMBRANE-COVERED CABLE STRUCTURE. A nonpressurized structure in which a mast and cable system provides support and tension to the membrane weather barrier and the membrane imparts stability to the structure.

MEMBRANE-COVERED FRAME STRUCTURE. A nonpressurized building wherein the structure is composed of a rigid framework to support a tensioned membrane which provides the weather barrier.

NONCOMBUSTIBLE MEMBRANE STRUCTURE. A membrane structure in which the membrane and all component parts of the structure are noncombustible.

4.4.2.3 Type of construction. Noncombustible membrane structures shall be classified as

Type IIB construction. Noncombustible frame or cable-supported structures covered by an approved membrane in accordance with Section 4.4.2.3.1 shall be classified as Type IIB construction. Heavy timber frame-supported structures covered by an approved membrane in accordance with Section 4.4.2.3.1 shall be classified as Type IV construction. Other membrane structures shall be classified as Type V construction.

Exception: Plastic less than 9150 mm above any floor used in greenhouses, where occupancy by the general public is not authorized, and for aquaculture pond covers, is not required to be flame resistant.

4.4.2.3.1 **Membrane and interior liner material.** Membranes and interior liners shall be either noncombustible as set forth in SBC 801, or flame resistant as determined in accordance with NFPA 701 and the manufacturer's test protocol.

Exception: Plastic less than 500 mm in thickness used in greenhouses, where occupancy by the general public is not authorized, and for aquaculture pond covers, is not required to be flame resistant.

4.4.2.4 **Allowable floor areas.** The area of a membrane structure shall not exceed the limitations set forth in Table 3.3, except as provided in Section 3.6.

4.4.2.5 **Maximum height.** Membrane structures shall not exceed one story nor shall such structures exceed the height limitations in feet set forth in Table 3.3.

Exception: Noncombustible membrane structures serving as roofs only.

4.4.2.6 **Mixed construction.** Membrane structures shall be permitted to be utilized as specified in this section as a portion of buildings of other types of construction. Height and area limits shall be as specified for the type of construction and occupancy of the building.

4.4.2.6.1 **Noncombustible membrane.** A noncombustible membrane shall be permitted for use as the roof or as a skylight of any building or atrium of a building of any type of construction provided it is at least 6.1 meters above any floor, balcony or gallery.

4.4.2.6.1.1 **Flame-resistant membrane.** A flame-resistant membrane shall be permitted to be used as the roof or as a skylight on buildings of Type IIB, III, IV and V construction provided it is at least 6.1 meters above any floor, balcony or gallery.

4.4.2.7 **Engineering design.** The structure shall be designed and constructed to sustain dead loads; loads due to tension or inflation; live loads including wind, or flood and seismic loads and in accordance with SBC 301.

4.4.2.8 **Inflation systems.** Air-supported and air-inflated structures shall be provided with primary and auxiliary inflation systems to meet the minimum requirements of Sections 4.4.2.8.1 through 4.4.2.8.3.

4.4.2.8.1 **Equipment requirements.** This inflation system shall consist of one or more blowers and shall include provisions for automatic control to maintain the required inflation pressures. The system shall be so designed as to prevent over-pressurization of the system.

4.4.2.8.1.1 **Auxiliary inflation system.** In addition to the primary inflation system, in buildings exceeding 140 m^2 in area, an auxiliary inflation system shall be provided with sufficient capacity to maintain the inflation of the structure in case of primary system failure. The auxiliary inflation system shall operate automatically when there is a loss of internal pressure and when the primary blower system becomes inoperative.

4.4.2.8.1.2 **Blower equipment.** Blower equipment shall meet the following requirements:

1. Blowers shall be powered by continuous-rated motors at the maximum power required for any flow condition as required by the structural design.
2. Blowers shall be provided with inlet screens, belt guards and other protective devices as required by the building official to provide protection from injury.

3. Blowers shall be housed within a weather-protecting structure.
4. Blowers shall be equipped with backdraft check dampers to minimize air loss when inoperative.
5. Blower inlets shall be located to provide protection from air contamination. The location of inlets shall be approved.

4.4.2.8.2 **Standby power.** Wherever an auxiliary inflation system is required, an approved standby power-generating system shall be provided. The system shall be equipped with a suitable means for automatically starting the generator set upon failure of the normal electrical service and for automatic transfer and operation of all of the required electrical functions at full power within 60 seconds of such service failure. Standby power shall be capable of operating independently for a minimum of 4 hours.

4.4.2.8.3 **Support provisions.** A system capable of supporting the membrane in the event of deflation shall be provided for in air-supported and air-inflated structures having an occupant load of more than 50 or where covering a swimming pool regardless of occupant load. The support system shall be capable of maintaining membrane structures used as a roof for Type I construction not less than 6.1 meters above floor or seating areas. The support system shall be capable of maintaining other membranes at least 2.2 meters above the floor, seating area or surface of the water.

4.4.3 Temporary Structures

4.4.3.1 **General.** The provisions of this section shall apply to structures erected for a period of less than 180 days. Tents and other membrane structures erected for a period of less than 180 days shall comply with SBC 801. Those erected for a longer period of time shall comply with applicable sections of this code requirements.

Exception: Provisions of SBC 801 shall apply to tents and membrane structures erected for a period of less than 180 days.

4.4.3.1.1 **Permit required.** Temporary structures that cover an area in excess of 11 m^2, including connecting areas or spaces with a common means of egress or entrance which are used or intended to be used for the gathering together of 10 or more persons, shall not be erected, operated or maintained for any purpose without obtaining a permit from the local building official.

4.4.3.2 **Construction documents.** A permit application and construction documents shall be submitted for each installation of a temporary structure. The construction documents shall include a site plan indicating the location of the temporary structure and information delineating the means of egress and the occupant load.

4.4.3.3 **Location.** Temporary structures shall be located in accordance with the requirements of Table 4.2 based on the fire-resistance rating of the exterior walls for the proposed type of construction.

4.4.3.4 **Means of egress.** Temporary structures shall conform to the means of egress requirements of Chapter 8 and shall have a maximum exit access travel distance of 30.0 meters.

4.4.4 Pedestrian Walkways and Tunnels

4.4.4.1 **General.** This section shall apply to connections between buildings such as pedestrian walkways or tunnels, located at, above or below grade level, that are used as a means of travel by persons. The pedestrian walkway shall not contribute to the building area or the number of stories or height of connected buildings.

4.4.4.2 **Separate structures.** Connected buildings shall be considered to be separate structures.

Exceptions:

1. Buildings on the same lot in accordance with Section 3.3.1.3.
2. For purposes of calculating the number of Type B units required by Chapter 9, structurally connected buildings and buildings with multiple wings shall be considered one structure.

4.4.4.3 **Construction.** The pedestrian walkway shall be of noncombustible construction.

Exception: Combustible construction shall be permitted where connected buildings are of combustible construction.

4.4.4.4 **Contents.** Only materials and decorations approved by the local building official shall be located in the pedestrian walkway.

4.4.4.5 **Fire barriers between pedestrian walkways and buildings.** Walkways shall be separated from the interior of the building by fire barrier walls with a fire-resistance rating of not less than 2 hours. This protection shall extend vertically from a point 3.0 meters above the walkway roof surface or the connected building roof line, whichever is lower, down to a point 3.0 meters below the walkway and horizontally 3.0 meters from each side of the pedestrian walkway. Openings within the 3.0 meters horizontal extension of the protected walls beyond the walkway shall be equipped with devices providing a 3/4-hour fire protection rating in accordance with SBC 801.

Exception: The walls separating the pedestrian walkway from a connected building are not required to have a fire-resistance rating by this section where any of the following conditions exist:

1. The distance between the connected buildings is more than 3.0 meters the pedestrian walkway and connected buildings are equipped throughout with an automatic sprinkler system in accordance with NFPA 13 and the wall is constructed of a tempered, wired or laminated glass wall and doors subject to the following:
   - 1.1 The glass shall be protected by an automatic sprinkler system in accordance with NFPA 13 and the sprinkler system shall completely wet the entire surface of interior sides of the glass wall when actuated.
   - 1.2 The glass shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler operates.
   - 1.3 Obstructions shall not be installed between the sprinkler heads and the glass.
2. The distance between the connected buildings is more than 3.0 meters, and both sidewalls of the pedestrian walkway are at least 50 percent open with the open area uniformly distributed to prevent the accumulation of smoke and toxic gases.
3. Buildings are on the same lot, in accordance with Section 3.3.1.3.
4. Where exterior walls of connected buildings are required by SBC 801 to have a fire-resistance rating greater than 2 hours, the walkway shall be equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13.

   The previous exceptions shall apply to pedestrian walkways having a maximum height above grade of three stories or 12.2 meters, or five stories or 16.8 meters where sprinklered.

4.4.4.6 **Public way.** Pedestrian walkways over a public way shall also comply with Chapter 12.

4.4.4.7 **Egress.** Access shall be provided at all times to a pedestrian walkway that serves as a required exit.

4.4.4.8 **Width.** The unobstructed width of pedestrian walkways shall not be less than 900

mm. The total width shall not exceed 9.0 meters.

4.4.4.9 **Exit access travel.** The length of exit access travel shall not exceed 60.0 meters.

Exceptions:

1. Exit access travel distance on a pedestrian walkway equipped throughout with an automatic sprinkler system in accordance with NFPA 13 shall not exceed 75.0 meters.
2. Exit access travel distance on a pedestrian walkway constructed with both sides at least 50 percent open shall not exceed 90.0 meters.
3. Exit access travel distance on a pedestrian walkway constructed with both sides at least 50 percent open, and equipped throughout with an automatic sprinkler system in accordance with NFPA 13, shall not exceed 122 meters.

4.4.4.10 **Tunneled walkway.** Separation between the tunneled walkway and the building to which it is connected shall not be less than 2-hour fire-resistant construction and openings therein shall be protected in accordance with Table 4B.15.3 of SBC 801.

4.4.4.11 **Ventilation.** Smoke and heat vents shall be provided for enclosed walkways and tunneled walkways as required for Group F-1 occupancies in accordance with Section 7.10 of SBC 801.

4.4.5 Awnings and Canopies

4.4.5.1 **General.** Awnings or canopies shall comply with the requirements of this section and other applicable sections of this code requirements.

4.4.5.2 **Definition.** The following term shall, for the purposes of this section and as used elsewhere in this code requirements, have the meaning shown herein.

RETRACTABLE AWNING. A retractable awning is a cover with a frame that retracts against a building or other structure to which it is entirely supported.

4.4.5.3 **Design and construction.** Awnings and canopies shall be designed and constructed to withstand wind or other lateral loads and live loads as required by SBC 301 with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration. Awnings shall have frames of noncombustible material, fire-retardant-treated wood, wood of Type IV size, or 1-hour construction with combustible or noncombustible covers and shall be either fixed, retractable, folding or collapsible.

4.4.5.4 **Canopy materials.** Canopies shall be constructed of a rigid framework with an approved covering, that is flame resistant in accordance with NFPA 701 or has a flame spread index not greater than 25 when tested in accordance with ASTM E 84.

4.4.6 Marquees

4.4.6.1 **General.** Marquees shall comply with this section and other applicable sections of this code requirements.

4.4.6.2 **Thickness.** The maximum height or thickness of a marquee measured vertically from its lowest to its highest point shall not exceed 900 mm where the marquee projects more than two-thirds of the distance from the property line to the curb line, and shall not exceed 2.8 meters where the marquee is less than two-thirds of the distance from the property line to the curb line.

4.4.6.3 **Roof construction.** Where the roof or any part thereof is a skylight, the skylight shall comply with the requirements of Chapter 11, every roof and skylight of a marquee shall be sloped to downspouts that shall conduct any drainage from the marquee in such a manner so as not to spill over the sidewalk.

4.4.6.4 **Location prohibited.** Every marquee shall be so located as not to interfere with the operation of any exterior standpipe, and such that the marquee does not

obstruct the clear passage of stairways or exit discharge from the building or the installation or maintenance of street lighting.

4.4.6.5 **Construction.** A marquee shall be supported entirely from the building and constructed of noncombustible materials. Marquees shall be designed as required in SBC 301 Structural members shall be protected to prevent deterioration.

4.4.7 Signs

4.4.7.1 **General.** Signs shall be designed, constructed and maintained in accordance with this code requirements.

4.4.8 Radio and Television Towers

4.4.8.1 **General.** Subject to the provisions of SBC 301 and the requirements of Chapter 6 governing the fire-resistance ratings of buildings for the support of roof structures, radio and television towers shall be designed and constructed as herein provided.

4.4.8.2 **Location and access.** Towers shall be located and equipped with step bolts and ladders so as to provide ready access for inspection purposes. Guy wires or other accessories shall not cross or encroach upon any street or other public space, or over above-ground electric utility lines, or encroach upon any privately owned property without written consent of the owner of the encroached-upon property, space or above-ground electric utility lines.

4.4.8.3 **Construction.** Towers shall be constructed of approved corrosion-resistant noncombustible material. The minimum type of construction of isolated radio towers not more than 30.0 meters in height shall be Type IIB.

4.4.8.4 **Loads.** Towers shall be designed to resist wind loads in accordance with SBC 301.

4.4.8.4.1 **Dead load.** Towers shall be designed for the dead load plus the ice load in regions where ice formation could occurs.

4.4.8.4.2 **Wind load.** Adequate foundations and anchorage shall be provided to resist two times the calculated wind load.

4.4.8.5 **Grounding.** Towers shall be permanently and effectively grounded.

4.4.9 Swimming Pool Enclosures and Safety Devices

4.4.9.1 **General.** Swimming pools shall comply with the requirements of this section and other applicable sections of this code requirements.

4.4.9.2 **Definition.** The following word and term shall, for the purposes of this section and as used elsewhere in this code requirements, have the meaning shown herein.

SWIMMING POOLS. Any structure intended for swimming, recreational bathing or wading that contains water over 600 mm deep. This includes in-ground, above-ground and on-ground pools; hot tubs; spas and fixed-in-place wading pools.

4.4.9.3 **Public swimming pools.** Public swimming pools shall be completely enclosed by a fence at least 1.3 meters in height or a screen enclosure. Openings in the fence shall not permit the passage of a 100 mm sphere. The fence or screen enclosure shall be equipped with self-closing and self-latching gates.

4.4.9.4 **Residential swimming pools.** Residential swimming pools shall comply with Sections 4.4.9.4.1 through 4.4.9.4.3. Exception: A swimming pool with a power safety cover or a spa with a safety cover complying with ASTM F 1346.

4.4.9.4.1 **Barrier height and clearances.** The top of the barrier shall be at least 1.2 meters above grade measured on the side of the barrier that faces away from the swimming pool. The maximum vertical clearance between grade and the bottom of the barrier shall be 50 mm measured on the side of the barrier that faces away from the swimming pool. Where the top of the pool structure is above grade, the barrier is authorized to be at ground level or mounted on top of the pool structure, the

maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 100 mm.

4.4.9.4.1.1 **Openings.** Openings in the barrier shall not allow passage of a 100 mm diameter sphere.

4.4.9.4.1.2 **Solid barrier surfaces.** Solid barriers which do not have openings shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.

4.4.9.4.1.3 **Closely spaced horizontal members.** Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 1.2 meters, the horizontal members shall be located on the swimming pool side of the fence. Spacing between vertical members shall not exceed 45 mm in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 45 mm in width.

4.4.9.4.1.4 **Widely spaced horizontal members.** Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 1.2 meters or more, spacing between vertical members shall not exceed 100 mm. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 45 mm in width.

4.4.9.4.1.5 **Chain link dimensions.** Maximum mesh size for chain link fences shall be a square with a 57 mm side unless the fence is provided with slats fastened at the top or the bottom which reduce the openings to no more than 45 mm.

4.4.9.4.1.6 **Diagonal members.** Where the barrier is composed of diagonal members, the maximum opening formed by the diagonal members shall be no more than 45 mm.

4.4.9.4.1.7 **Gates.** Access gates shall comply with the requirements of Sections 4.4.9.4.1.1 through 4.4.9.4.1.6 and shall be equipped to accommodate a locking device. Pedestrian access gates shall open outward away from the pool and shall be self-closing and have a self-latching device. Gates other than pedestrian access gates shall have a self-latching device. Where the release mechanism of the self-latching device is located less than 1.4 meters from the bottom of the gate, the release mechanism shall be located on the pool side of the gate at least 75 mm below the top of the gate, and the gate and barrier shall have no opening greater than 13 mm within 460 mm of the release mechanism.

4.4.9.4.1.8 **Dwelling wall as a barrier.** Where a wall of a dwelling serves as part of the barrier, one of the following shall apply:

1. Doors with direct access to the pool through that wall shall be equipped with an alarm which produces an audible warning when the door and its screen are opened. The alarm shall sound continuously for a minimum of 30 seconds immediately after the door is opened and be capable of being heard throughout the house during normal household activities. The alarm shall automatically reset under all conditions. The alarm shall be equipped with a manual means to temporarily deactivate the alarm for a single opening. Such deactivation shall last no more than 15 seconds. The deactivation switch shall be located at least 1.4 meters above the threshold of the door.

2. The pool shall be equipped with a power safety cover which complies with ASTM F 1346.

3. Other means of protection, such as self-closing doors with self-latching devices, which are approved by the administrative local authority, shall be accepted so long as the degree of protection afforded is not less than the protection afforded by Section 4.4.9.4.1.8, Item 1 or 2.

4.4.9.4.1.9 **Pool structure as barrier.** Where an aboveground pool structure is used as a barrier or where the barrier is mounted on top of the pool structure, and the means of access is a ladder or steps, then the ladder or steps either shall be capable of

being secured, locked or removed to prevent access, or the ladder or steps shall be surrounded by a barrier which meets the requirements of Sections 4.4.9.4.1.1 through 4.4.9.4.1.8. When the ladder or steps are secured, locked or removed, any opening created shall not allow the passage of a 100 mm diameter sphere.

4.4.9.4.2 **Indoor swimming pools.** Walls surrounding indoor swimming pools shall not be required to comply with Section 4.4.9.4.1.8.

4.4.9.4.3 **Prohibited locations.** Barriers shall be located so as to prohibit permanent structures, equipment or similar objects from being used to climb the barriers.

4.4.9.5 **Entrapment avoidance.** Where the suction inlet system, such as an automatic cleaning system, is a vacuum cleaner system which has a single suction inlet, or multiple suction inlets which can be isolated by valves, each suction inlet shall protect against user entrapment by an approved antivortex cover, a 300 by 300 mm or larger grate, or other approved means.

In addition, all pools and spas shall be equipped with an alternative backup system which shall provide vacuum relief should grate covers be missing. Alternative vacuum relief devices shall include one of the following:

1. Approved vacuum release system.
2. Approved vent piping.
3. Other approved devices or means.

CHAPTER 5
EXTERIOR WALLS

SECTION 5.1
GENERAL

5.1.1 **Scope.** The provisions of this chapter shall establish the minimum requirements for exterior walls, exterior wall coverings, exterior wall openings, exterior windows and doors, architectural trim, balconies and bay windows.

SECTION 5.2
DEFINITIONS

5.2.1 **General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

ADHERED MASONRY VENEER. Veneer secured and supported through the adhesion of an approved bonding material applied to an approved backing.

ANCHORED MASONRY VENEER. Veneer secured with approved mechanical fasteners to an approved backing.

BACKING. The wall or surface to which the veneer is secured.

EXTERIOR WALL. A wall, bearing or nonbearing, that is used as an enclosing wall for a building, other than a fire wall, and that has a slope of 60 degrees (1.05 rad) or greater with the horizontal plane.

EXTERIOR WALL COVERING. A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, fascias, gutters and leaders.

EXTERIOR WALL ENVELOPE. A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.

FIBER CEMENT SIDING. A manufactured, fiber-reinforcing product made with an inorganic hydraulic or calcium silicate binder formed by chemical reaction and reinforced with organic or inorganic non-asbestos fibers, or both. Additives that enhance manufacturing or product performance are permitted. Fiber cement siding products have either smooth or textured faces and are intended for exterior wall and related applications.

METAL COMPOSITE MATERIAL (MCM). A factory-manufactured panel consisting of metal skins bonded to both faces of a plastic core.

METAL COMPOSITE MATERIAL (MCM) SYSTEM. An exterior wall finish system fabricated using MCM in a specific assembly including joints, seams,

attachments, substrate, framing and other details as appropriate to a particular design.

VENEER. A facing attached to a wall for the purpose of providing ornamentation, protection or insulation, but not counted as adding strength to the wall.

SECTION 5.3
PERFORMANCE REQUIREMENTS

5.3.1 **General.** The provisions of this section shall apply to exterior walls, wall coverings and components thereof.

5.3.2 **Weather protection.** Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing, as described in Section 5.5.3. The exterior wall envelope shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a water-resistive barrier behind the exterior veneer as described in Section 5.4.2 and a means for draining water that enters the assembly to the exterior of the veneer, unless it is determined that penetration of water behind the veneer shall not be detrimental to the building performance. Protection against condensation in the exterior wall assembly shall be provided in accordance with the SBC 601.

Exceptions:

1. A weather-resistant exterior wall envelope shall not be required over concrete or masonry walls designed in accordance with SBC 304 and SBC 305, respectively.

2. Compliance with the requirements for a means of drainage, and the requirements of Sections 5.5.2 and 5.5.3, shall not be required for an exterior wall envelope that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E 331 under the following conditions:

2.1 Exterior wall envelope test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.

2.2 Exterior wall envelope test assemblies shall be at least 1.2 by 2 meters in size.

2.3 Exterior wall envelope assemblies shall be tested at a minimum differential pressure of 0.3 kN/m^2.

2.4 Exterior wall envelope assemblies shall be subjected to a minimum test exposure duration of 2 hours.

The exterior wall envelope design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the exterior wall envelope, joints at the perimeter of openings or intersections of terminations with dissimilar materials.

5.3.3 **Vapor retarder.** An approved vapor retarder shall be provided.

Exceptions:

1. Where other approved means to avoid condensation and leakage of moisture are provided.

2. Plain and reinforced concrete or masonry exterior walls designed and constructed in accordance with SBC 304 and SBC 305, respectively.

5.3.4 **Structural.** Exterior walls, and the associated openings, shall be designed and constructed to resist safely the superimposed loads required by SBC 301.

5.3.5 **Fire resistance.** Exterior walls shall be fire-resistance rated as required by other sections of this code with opening protection as required by SBC 801.

5.3.6 **Flood resistance.** For buildings in flood hazard areas as established in SBC 301, exterior walls extending below the design flood elevation shall be resistant to water damage. Wood shall be pressure-preservative treated in accordance with AWPA C1, C2, C3, C4, C9, C15, C18, C22, C23, C24, C28, P1, P2 and P3, or decay-resistant heartwood of redwood, black locust or cedar.

5.3.7 **Flood resistance for high-velocity wave action areas.** For buildings in flood hazard areas subject to high-velocity wave action as established in SBC 301, electrical, mechanical and plumbing system components shall not be mounted on or penetrate through exterior walls that are designed to break away under flood loads.

SECTION 5.4
MATERIALS

5.4.1 **General.** Materials used for the construction of exterior walls shall comply with the provisions of this section. Materials not prescribed herein shall be permitted, provided that any such alternative has been approved.

5.4.2 **Water-resistive barrier.** A minimum of one layer of No. 15 asphalt felt, complying with ASTM D 226 for Type 1 felt, shall be attached to the sheathing, with flashing as described in Section 5.5.3, in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer.

5.4.3 **Wood.** Exterior walls of wood construction shall be designed and constructed in accordance with an approved methods.

5.4.3.1 **Basic hardboard.** Basic hardboard shall conform to the requirements of AHA A135.4.

5.4.3.2 **Hardboard siding.** Hardboard siding shall conform to the requirements of AHA A135.6 and, where used structurally, shall be so identified by the label of an approved agency.

5.4.4 **Masonry.** Exterior walls of masonry construction shall be designed and constructed in accordance with this section and SBC 501. Masonry units, mortar and metal accessories used in anchored and adhered veneer shall meet the physical requirements of SBC 501. The backing of anchored and adhered veneer shall be of concrete, masonry, steel framing or wood framing.

5.4.5 **Metal.** Exterior walls of formed steel construction, structural steel or lightweight metal alloys shall be designed in accordance with SBC 601.

5.4.5.1 **Aluminum siding.** Aluminum siding shall conform to the requirements of AAMA 1402.

5.4.6 **Concrete.** Exterior walls of concrete construction shall be designed and constructed in accordance with SBC 304.

5.4.7 **Glass-unit masonry.** Exterior walls of glass-unit masonry shall be designed and constructed in accordance with SBC 305.

5.4.8 **Plastics.** Plastic panel, apron or spandrel walls as defined in this code shall not be limited in thickness, provided that such plastics and their assemblies conform to the requirements of Chapter 11 and are constructed of approved weather-resistant materials of adequate strength to resist the wind loads for cladding specified in Chapter 11.

5.4.9 **Vinyl siding.** Vinyl siding shall conform to the requirements of ASTM D 3679.

5.4.10 **Fiber cement siding.** Fiber cement siding shall conform to the requirements of ASTM C 1186 and shall be so identified on labeling listing an approved local concerning quality control agency.

SECTION 5.5
INSTALLATION OF WALL COVERINGS

5.5.1 **General.** Exterior wall coverings shall be designed and constructed in accordance with the applicable provisions of this section.

5.5.2 **Weather protection.** Exterior walls shall provide weather protection for the building. The materials of the minimum nominal thickness specified in Table 5.5.2 shall be acceptable as approved weather coverings.

5.5.3 **Flashing.** Flashing shall be installed in such a manner so as to prevent moisture from entering the wall or to redirect it to the exterior. Flashing shall be installed at the perimeters of exterior door and window assemblies, penetrations and terminations of exterior wall assemblies, exterior wall intersections with roofs, chimneys, porches, decks, balconies and similar projections and at built-in gutters and similar locations where moisture could enter the wall. Flashing with projecting flanges shall be installed on both sides and the ends of copings, under sills and continuously above projecting trim.

5.5.3.1 **Exterior wall pockets.** In exterior walls of buildings or structures, wall pockets or crevices in which moisture can accumulate shall be avoided or protected with caps or drips, or other approved means shall be provided to prevent water damage.

5.5.3.2 **Masonry.** Flashing and weepholes shall be located in the first course of masonry above finished ground level above the foundation wall or slab, and other points of support, including structural floors, shelf angles and lintels where anchored veneers are designed in accordance with Section 5.5.5.

TABLE 5.5.2
MINIMUM THICKNESS OF WEATHER COVERINGS

COVERING TYPE	MINIMUM THICKNESS (mm)
Adhered masonry veneer	6.4
Anchored masonry veneer	66.7
Aluminum siding	0.5
Asbestos-cement boards	3.2
Asbestos shingles	4
Cold-rolled copper[d]	0.6
Copper shingles[d]	0.4
Exterior plywood (with sheathing)	8
Exterior plywood (without sheathing)	
Fiberboard siding	12.5
Fiber cement lap siding	6.4
Fiber cement panel siding	6.4
Glass-fiber reinforced concrete panels	10
Hardboard siding[c]	6.4
High-yield copper[d]	0.4
Lead-coated copper[d]	0.6
Lead-coated high-yield copper	0.4
Marble slabs	25.4
Precast stone facing	16
Steel (approved corrosion resistant)	0.4
Stone (cast artificial)	38
Stone (natural)	51
Structural glass	8.7
Metal plaster base	22
Unit masonry	16
Cast-in-place or precast concrete	16
Unit masonry	1.3
Cast-in-place or precast concrete	9.5
Terra cotta (anchored)	25
Terra cotta (adhered)	6.4
Vinyl siding	1
Wood shingles	9.5
Wood siding (without sheathing)a	18.5

a) Wood siding of thicknesses less than 125 mm shall be placed over sheathing that conforms to Section 2304.6, IBC.
b) Exclusive of texture.
c) As measured at the bottom of decorative grooves.
d) 4.8 Kg/m^2 for cold-rolled copper and lead-coated copper, 3.6 Kg/m^2 for copper shingles, high-yield copper and lead-coated high-yield copper.

5.5.4 **Wood veneers.** Wood veneers on exterior walls of buildings of Type I, II, III and IV construction shall be not less than 25 mm nominal thickness, 11 mm exterior hardboard siding or 9.5 mm exterior-type wood structural panels or particleboard and shall conform to the following:

1. The veneer does not exceed three stories in height, measured from grade, except where fire-retardant-treated wood is used, the height shall not exceed four stories.

2. The veneer is attached to or furred from a noncombustible backing that is fire-resistance rated as required by other provisions of this code requirements.
3. Where open or spaced wood veneers (without concealed spaces) are used, they shall not project more than 610 mm from the building wall.

5.5.5 **Anchored masonry veneer.** Anchored masonry veneer shall comply with the provisions of SBC 305.

5.5.5.1 **Tolerances.** Anchored masonry veneers in accordance with Chapter 5 are not required to meet the tolerances in SBC 305.

5.5.5.2 **Seismic requirements.** Anchored masonry veneer located in Seismic Design shall conform to the requirements of SBC 301 and 305.

5.5.6 **Stone veneer.** Stone veneer units not exceeding 250 mm in thickness shall be anchored directly to masonry, concrete or to stud construction by one of the following methods:

1. With concrete or masonry backing, anchor ties shall be not less than 2.7 mm corrosion-resistant wire, or approved equal, formed beyond the base of the backing. The legs of the loops shall be not less than 150 mm in length bent at right angles and laid in the mortar joint, and spaced so that the eyes or loops are 300 mm maximum on center (o.c.) in both directions. There shall be provided not less than a 2.7 mm corrosion-resistant wire tie, or approved equal, threaded through the exposed loops for every 0.2 m^2 of stone veneer. This tie shall be a loop having legs not less than 380 mm in length bent so that it will lie in the stone veneer mortar joint. The last 50 mm of each wire leg shall have a right-angle bend. A25 mm minimum thickness of cement grout shall be placed between the backing and the stone veneer.
2. With stud backing, a 50 by 50 mm 1.6 mm corrosion-resistant wire mesh with two layers of waterproofed paper backing in accordance with Section 5.3.3 shall be applied directly to wood studs spaced a maximum of 400 mm o.c. On studs, the mesh shall be attached with 50 mm long corrosion-resistant steel wire furring nails at 100 mm o.c. providing a minimum 30 mm penetration into each stud and with 8d common nails at 200 mm o.c. into top and bottom plates or with equivalent wire ties. There shall be not less than 2.7 mm corrosion-resistant wire, or approved equal, looped through the mesh for every 0.2 m^2 of stone veneer. This tie shall be a loop having legs not less than 380 mm in length, so bent that it will lie in the stone veneer mortar joint. The last 51 mm of each wire leg shall have a right-angle bend. A 25 mm minimum thickness of cement grout shall be placed between the backing and the stone veneer.

5.5.7 **Slab-type veneer.** Slab-type veneer units not exceeding 50 mm in thickness shall be anchored directly to masonry, concrete or stud construction. For veneer units of marble, travertine, granite or other stone units of slab form ties of corrosion-resistant dowels in drilled holes located in the middle third of the edge of the units spaced a maximum of 610 mm apart around the periphery of each unit with not less than four ties per veneer unit. Units shall not exceed 1.9 m^2 in area. If the dowels are not tight fitting, the holes shall be drilled not more than 1.6 mm larger in diameter than the dowel, with the hole countersunk to a diameter and depth equal to twice the diameter of the dowel in order to provide a tight-fitting key of cement mortar at the dowel locations when the mortar in the joint has set. Veneer ties shall be corrosion-resistant metal capable of resisting, in tension or compression, a force equal to two times the weight of the attached veneer. If made of sheet metal,

veneer ties shall be not smaller in area than 0.85 by 25 mm or, if made of wire, not smaller in diameter than 3.8 mm wire.

5.5.8 **Terra cotta.** Anchored terra cotta or ceramic units not less than 40 mm thick shall be anchored directly to masonry, concrete or stud construction. Tied terra cotta or ceramic veneer units shall be not less than 40 mm thick with projecting dovetail webs on the back surface spaced approximately 203 mm o.c. The facing shall be tied to the backing wall with corrosion-resistant metal anchors of not less than No. 8 gage wire installed at the top of each piece in horizontal bed joints not less than 300 mm nor more than 460 mm o.c, these anchors shall be secured to 6.4 mm corrosion-resistant pencil rods that pass through the vertical aligned loop anchors in the backing wall. The veneer ties shall have sufficient strength to support the full weight of the veneer in tension. The facing shall be set with not less than a 50 mm space from the backing wall and the space shall be filled solidly with portland cement grout and pea gravel. Immediately prior to setting, the backing wall and the facing shall be drenched with clean water and shall be distinctly damp when the grout is poured.

5.5.9 **Adhered masonry veneer.** Adhered masonry veneer shall comply with the applicable requirements in SBC 305.

5.5.9.1 **Adhesion.** Adhesion developed between adhered veneer units and backing shall have a shear strength of at least 0.34 MPa based on gross unit surface area or shall be adhered in compliance with SBC 305.

5.5.9.1.1 **Interior masonry veneers.** Interior masonry veneers shall have a maximum weight of 0.958 kg/m^2 and shall be installed in accordance with Section 5.5.9. Where the interior veneer is supported by wood construction, the supporting members shall be designed to limit deflection to 1/600 of the span of the supporting members.

5.5.10 **Metal veneers.** Veneers of metal shall be fabricated from approved corrosion-resistant materials or shall be protected front and back with porcelain enamel, or otherwise be treated to render the metal resistant to corrosion. Such veneers shall not be less than 0.378 mm nominal thickness sheet steel mounted on wood or metal furring strips or approved sheathing on the wood construction.

5.5.10.1 **Attachment.** Exterior metal veneer shall be securely attached to the supporting masonry or framing members with corrosion-resistant fastenings, metal ties or by other approved devices or methods. The spacing of the fastenings or ties shall not exceed 610 mm either vertically or horizontally, but where units exceed 0.4 m^2 in area there shall be not less than four attachments per unit. The metal attachments shall have a cross-sectional area not less than provided by W 1.7 wire. Such attachments and their supports shall be capable of resisting a horizontal force in accordance with the wind loads specified in Section 11.15, but in no case less than 0.958 kg/m^2.

5.5.10.2 **Weather protection.** Metal supports for exterior metal veneer shall be protected by painting, galvanizing or by other equivalent coating or treatment. Wood studs, furring strips or other wood supports for exterior metal veneer shall be approved pressure-treated wood or protected as required in Section 5.3.2. Joints and edges exposed to the weather shall be caulked with approved durable waterproofing material or by other approved means to prevent penetration of moisture.

5.5.10.3 **Backup.** Masonry backup shall not be required for metal veneer except as is necessary to meet the fire-resistance requirements of SBC 801.

5.5.10.4 **Grounding.** Grounding of metal veneers on buildings shall comply with the

requirements of the SBC 401.

5.5.11 **Glass veneer.** The area of a single section of thin exterior structural glass veneer shall not exceed 1 m^2 where it is not more than 4.6 meters above the level of the sidewalk or grade level directly below, and shall not exceed 0.6 m^2 where it is more than 4.6 meters above that level.

5.5.11.1 **Length and height.** The length or height of any section of thin exterior structural glass veneer shall not exceed 1.2 meters.

5.5.11.2 **Thickness.** The thickness of thin exterior structural glass veneer shall be not less than 9 mm.

5.5.11.3 **Application.** Thin exterior structural glass veneer shall be set only after backing is thoroughly dry and after application of an approved bond coat uniformly over the entire surface of the backing so as to effectively seal the surface. Glass shall be set in place with an approved mastic cement in sufficient quantity so that at least 50 percent of the area of each glass unit is directly bonded to the backing by mastic not less than 6 mm thick and not more than 16 mm thick. The bond coat and mastic shall be evaluated for compatibility and shall bond firmly together.

5.5.11.4 **Installation at sidewalk level.** Where glass extends to a sidewalk surface, each section shall rest in an approved metal molding, and be set at least 6 mm above the highest point of the sidewalk. The space between the molding and the sidewalk shall be thoroughly caulked and made water tight.

5.5.11.4.1 **Installation above sidewalk level.** Where thin exterior structural glass veneer is installed above the level of the top of a bulkhead facing, or at a level more than 900 mm above the sidewalk level, the mastic cement binding shall be supplemented with approved nonferrous metal shelf angles located in the horizontal joints in every course. Such shelf angles shall be not less than 12 mm thick and not less than 50 mm long and shall be spaced at approved intervals, with not less than two angles for each glass unit. Shelf angles shall be secured to the wall or backing with expansion bolts, toggle bolts or by other approved methods.

5.5.11.5 **Joints.** Unless otherwise specifically approved by the building official, abutting edges of thin exterior structural glass veneer shall be ground square. Mitered joints shall not be used except where specifically approved for wide angles. Joints shall be uniformly buttered with an approved jointing compound and horizontal joints shall be held to not less than 1.6 mm by an approved non-rigid substance or device. Where thin exterior structural glass veneer abuts non-resilient material at sides or top, expansion joints not less than 6 mm wide shall be provided.

5.5.11.6 **Mechanical fastenings.** Thin exterior structural glass veneer installed above the level of the heads of show windows and veneer installed more than 3.7 meters above sidewalk level shall, in addition to the mastic cement and shelf angles, be held in place by the use of fastenings at each vertical or horizontal edge, or at the four corners of each glass unit. Fastenings shall be secured to the wall or backing with expansion bolts, toggle bolts or by other methods. Fastenings shall be so designed as to hold the glass veneer in a vertical plane independent of the mastic cement. Shelf angles providing both support and fastenings shall be permitted.

5.5.11.7 **Flashing.** Exposed edges of thin exterior structural glass veneer shall be flashed with overlapping corrosion-resistant metal flashing and caulked with a waterproof compound in a manner to effectively prevent the entrance of moisture between the glass veneer and the backing.

5.5.12 **Exterior windows and doors.** Windows and doors installed in exterior walls shall conform to the testing and performance requirements of SBC 302.

5.5.12.1 **Installation.** Windows and doors shall be installed in accordance with approved

manufacturer's instructions. Fastener size and spacing shall be provided in such instructions and shall be calculated based on maximum loads and spacing used in the tests.

5.5.13 **Vinyl siding.** Vinyl siding conforming to the requirements of this section and complying with ASTM D 3679 shall be permitted on exterior walls of buildings of Type V construction located in areas where the basic wind speed specified in SBC 301 does not exceed 160 km/h and the building height is less than 12.2 meters in Exposure C. Where construction is located in areas where the basic wind speed exceeds 161 km/h, or building heights are in excess of 12.2 meters, tests or calculations indicating compliance with SBC 301 shall be submitted. Vinyl siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

5.5.13.1 **Application.** The siding shall be applied over approved sheathing or materials. Siding shall be applied to conform with the weather-resistant barrier requirements in Section 5.3. Siding and accessories shall be installed in accordance with approved manufacturer's instructions. Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding and accessories shall have a minimum 8 mm head diameter and 3.2 mm shank diameter. The nails shall be corrosion resistant and shall be long enough to penetrate the studs or nailing strip at least 20 mm. Where the siding is installed horizontally, the fastener spacing shall not exceed 400 mm horizontally and 300 mm vertically. Where the siding is installed vertically, the fastener spacing shall not exceed 300 mm horizontally and 300 mm vertically.

5.5.14 **Cement plaster.** Cement plaster applied to exterior walls shall conform to the requirements specified in Chapter 10.

5.5.15 **Fiber cement siding.** Fiber cement siding complying with Section 5.4.10 shall be permitted on exterior walls of Type I, II, III, IV and V construction for wind pressure resistance or wind speed exposures as indicated in the manufacturer's compliance report and approved installation instructions. Where specified, the siding shall be installed over an approved sheathing or materials and shall be installed to conform to the weather-resistant barrier requirements in Section 5.3. Siding and accessories shall be installed in accordance with approved manufacturer's instructions. Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding to wood studs shall be corrosion-resistant round head smooth shank and shall be long enough to penetrate the studs at least 25 mm. For metal framing, all-weather screws shall be used and shall penetrate the metal framing at least three full threads.

5.5.16 **Fastening.** Weather boarding and wall coverings shall be securely fastened with aluminum, copper, zinc, zinc-coated or other approved corrosion-resistant fasteners in accordance with the approved manufacturer's installation instructions. Shingles and other weather coverings shall be attached with appropriate standard-shingle nails to furring strips securely nailed to studs, or with approved mechanically bonding nails, except where sheathing is of wood not less than 25 mm nominal thickness or of wood structural panels.

5.5.17 **Fiber cement siding.**

5.5.17.1 **Panel siding.** Panels shall be installed with the long dimension parallel to framing. Vertical joints shall occur over framing members and shall be sealed with

caulking or covered with battens. Horizontal joints shall be flashed with Z-flashing and blocked with solid wood framing.

5.5.17.2 **Horizontal lap siding.** Lap siding shall be lapped a minimum of 32 mm and shall have the ends sealed with caulking, covered with an H-section joint cover or located over a strip of flashing. Lap siding courses shall be permitted to be installed with the fastener heads exposed or concealed, according to approved manufacturers' instructions.

SECTION 5.6 COMBUSTIBLE MATERIALS ON THE EXTERIOR SIDE OF EXTERIOR WALLS

5.6.1 **General.** This section shall apply to exterior wall coverings, balconies and similar appendages, and bay and oriel windows constructed of combustible materials.

5.6.2 **Combustible exterior wall coverings.** Combustible exterior wall coverings shall comply with this section.

Exception: Plastics complying with Chapter 11.

5.6.2.1 **Ignition resistance.** Combustible exterior wall coverings shall be tested in accordance with NFPA 268.

Exceptions:

1. Wood or wood-based products.
2. Other combustible materials covered with an exterior covering other than vinyl sidings listed in Table 5.5.2.
3. Aluminum having a minimum thickness of 0.5 mm.
4. Exterior wall coverings on exterior walls of Type V construction.

5.6.2.1.1 **Fire separation 1.5 meters or less.** Where in stalled on exterior walls having a fire separation distance of 1.5 meters or less, combustible exterior wall coverings shall not exhibit sustained flaming as defined in NFPA 268.

5.6.2.1.2 **Fire separation greater than** 1.5 meters**.** For fire separation distances greater than 1.5 meters, an assembly shall be permitted that has been exposed to a reduced level of incident radiant heat flux in accordance with the NFPA 268 test method without exhibiting sustained flaming. The minimum fire separation distance required for the assembly shall be determined from Table 5.6.2.1.2 based on the maximum tolerable level of incident radiant heat flux that does not cause sustained flaming of the assembly.

5.6.2.2 **Architectural trim.** In buildings of Type I, II, III and IV construction that do not exceed three stories or 12.2 meters in height above grade plane, exterior wall coverings shall be permitted to be constructed of wood where permitted by Section 5.5.4 or other equivalent combustible material. Combustible exterior wall coverings, other than fire-retardant-treated wood for exterior installation, shall not exceed 10 percent of an exterior wall surface area where the fire separation distance is 1.5 meters or less. Architectural trim that exceeds 12.2 meters in height above grade plane shall be constructed of approved noncombustible materials and shall be secured to the wall with metal or other approved noncombustible brackets.

5.6.2.3 **Location.** Where combustible exterior wall covering is located along the top of exterior walls, such trim shall be completely backed up by the exterior wall and shall not extend over or above the top of exterior walls.

5.6.2.4 **Fireblocking.** Where the combustible exterior wall covering is furred from the wall and forms a solid surface, the distance between the back of the covering and the wall shall not exceed 40 mm and the space thereby created shall be fireblocked in accordance with SBC 801 so that there will be no open space exceeding 9.3 m^2.

Where wood furring strips are used, they shall be of approved wood of natural decay resistance or preservative-treated wood.

Exceptions:

1. Fireblocking of cornices is not required in single-family dwellings.

2. Fireblocking shall not be required where installed on noncombustible framing and the face of the exterior wall finish exposed to the concealed space is covered by one of the following materials:

2.1 Aluminum having a minimum thickness of 0.5 mm;

2.2 Corrosion-resistant steel having a base metal thickness not less than 0.4 mm at any point; or

2.3 Other approved noncombustible materials.

5.6.3 **Balconies and similar projections.** Balconies and similar projections of combustible construction, other than fire-retardant-treated wood, shall afford the fire-resistance rating required by Table 4.1 for floor construction or shall be of Type IV construction as described in Section 4.2.4, and the aggregate length shall not exceed 50 percent of the building perimeter on each floor.

TABLE 5.6.2.1.2
MINIMUM FIRE SEPARATION FOR COMBUSTIBLE VENEERS

FIRE SEPARATION DISTANCE (feet)	TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY(kW/m^2)	FIRE SEPARATION DISTANCE (feet)	TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY(kW/m^2)
1.5	12.5	4.9	5.9
1.8	11.8	5.2	5.5
2.1	11.0	5.5	5.2
2.4	10.3	5.8	4.9
2.7	9.6	6.1	4.6
3.1	8.9	6.4	4.4
3.4	8.3	6.7	4.1
3.7	7.7	7.0	3.9
4.0	7.2	7.3	3.7
4.3	6.7	7.6	3.5
4.6	6.3		

Exceptions:

1. On buildings of Type I and II construction, three stories or less in height, fire-retardant-treated wood shall be permitted for balconies, porches, decks and exterior stairways not used as required exits.

2. Untreated wood is permitted for pickets and rails, or similar guardrail devices that are limited to 1067 mm in height.

3. Balconies and similar appendages on buildings of Type III, IV and V construction shall be permitted to be of Type V construction, and shall not be required to have a fire-resistance rating where sprinkler protection is extended to these areas.

4. Where sprinkler protection is extended to the balcony areas, the aggregate length of the balcony on each floor shall not be limited.

5.6.4 **Bay windows and oriel windows.** Bay and oriel windows shall conform to the type of construction required for the building to which they are attached.

Exception: Fire-retardant-treated wood shall be permitted on buildings three stories or less of Type I, II, III and IV construction.

SECTION 5.7
METAL COMPOSITE MATERIALS (MCM)

5.7.1 **General.** The provisions of this section shall govern the materials, construction and quality of metal composite materials (MCM) for use as exterior wall coverings in addition to other applicable requirements of Chapters 5 and SBC 301.

5.7.2 **Exterior wall finish.** MCM used as exterior wall finish or as elements of balconies and similar appendages and bay and oriel windows to provide cladding or weather resistance shall comply with Sections 5.7.4 through 5.7.13.

5.7.3 **Architectural trim and embellishments.** MCM used as architectural trim or embellishments shall comply with Sections 5.7.7 through 5.7.13.

5.7.4 **Structural design.** MCM systems shall be designed and constructed to resist wind loads as required by SBC 301 for components and cladding.

5.7.5 **Approval.** Results of approved tests or an engineering analysis shall be submitted to the building official to verify compliance with the requirements of SBC 301 for wind loads.

5.7.6 **Weather resistance.** MCM systems shall comply with Section 5.3 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's installation instructions.

5.7.7 **Durability.** MCM systems shall be constructed of approved materials that maintain the performance characteristics required in Section 5.7 for the duration of use.

5.7.8 **Fire-resistance rating.** Where MCM systems are used on exterior walls required to have a fire-resistance rating in accordance with SBC 801, evidence shall be submitted to the building official that the required fire-resistance rating is maintained.

5.7.9 **Surface-burning characteristics.** Unless otherwise specified, MCM shall have a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E84.

5.7.10 **Type I, II, III and IV construction.** Where installed on buildings of Type I, II, III and IV construction, MCM systems shall comply with Sections 5.7.10.1 through 5.7.10.4, or 5.7.11.

5.7.10.1 **Surface-burning characteristics.** MCM shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E 84.

5.7.10.2 **Thermal barriers.** MCM shall be separated from the interior of a building by an approved thermal barrier consisting of 12.7 mm gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 120°C after 15 minutes of fire exposure in accordance with the standard time-temperature curve of ASTM E 119. The thermal barrier shall be installed in such a manner that it will remain in place for not less than 15 minutes based on a test conducted in accordance with UL 1715.

5.7.10.3 **Thermal barrier not required.** The thermal barrier specified for MCM in Section 5.7.10.2 is not required where:

1. The MCM system is specifically approved based on tests conducted in accordance with UL 1040 or UL 1715. Such testing shall be performed with the MCM in the maximum thickness intended for use. The MCM system shall include seams, joints and other typical details used in the installation and shall be tested in the manner intended for use.
2. The MCM is used as elements of balconies and similar appendages, architectural trim or embellishments.

5.7.10.4 **Full-scale tests.** The MCM exterior wall assembly shall be tested in accordance with, and comply with, the acceptance criteria of NFPA 285. Such testing shall be performed on the MCM system with the MCM in the maximum thickness intended for use.

5.7.11 **Alternate conditions.** MCM and MCM systems shall not be required to comply with Sections 5.7.10.1 through 5.7.10.4 provided such systems comply with Section 5.7.11.1 or 5.7.11.2.

5.7.11.1 **Installations up to 40 feet in height.** MCM shall not be installed more than 12.2 meters in height above the grade plane where installed in accordance with Sections 5.7.11.1.1 and 5.7.11.1.2.

5.7.11.1.1 **Fire separation distance of 5 feet or less.** Where the fire separation distance is 1.5 meters or less, the area of MCM shall not exceed 10 percent of the exterior wall surface.

5.7.11.1.2 **Fire separation distance greater than 5 feet.** Where the fire separation distance is greater than 1.5 meters, there shall be no limit on the area of exterior wall surface coverage using MCM.

5.7.11.2 **Installations up to 50 feet in height.** MCM shall not be installed more than 15.2 meters in height above the grade plane where installed in accordance with Sections 5.7.11.2.1 and 5.7.11.2.2.

5.7.11.2.1 **Self ignition temperature.** MCM shall have a self-ignition temperature of 343°C or greater when tested in accordance with ASTM D 1929.

5.7.11.2.2 **Limitations.** Sections of MCM shall not exceed 27.9 m^2 in area and shall be separated by a minimum of 1.2 meters vertically.

5.7.12 **Type V construction.** MCM shall be permitted to be installed on buildings of Type V construction.

5.7.13 **Labeling.** MCM shall be labeled in accordance with Section 5.3.5.

CHAPTER 6
ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 6.1
GENERAL

6.1.1 **Scope.** The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies, and rooftop structures.

SECTION 6.2
DEFINITIONS

6.2.1 **General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

BUILT-UP ROOF COVERING. Two or more layers of felt cemented together and surfaced with a cap sheet, mineral aggregate, smooth coating or similar surfacing material.

INTERLAYMENT. A layer of felt or non-bituminous saturated felt not less than 450 mm wide, shingled between each course of a wood-shake roof covering.

MECHANICAL EQUIPMENT SCREEN. A partially enclosed rooftop structure used to aesthetically conceal heating, ventilating and air conditioning (HVAC) electrical or mechanical equipment from view.

METAL ROOF PANEL. An interlocking metal sheet having a minimum installed weather exposure of 0.28 m^2 per sheet.

METAL ROOF SHINGLE. An interlocking metal sheet having an installed weather exposure less than 0.28 m^2 per sheet.

MODIFIED BITUMEN ROOF COVERING. One or more layers of polymer-modified asphalt sheets. The sheet materials shall be fully adhered or mechanically attached to the substrate or held in place with an approved ballast layer.

PENTHOUSE. An enclosed, unoccupied structure above the roof of a building, other than a tank, tower, spire, dome cupola or bulkhead, occupying not more than one-third of the roof area.

POSITIVE ROOF DRAINAGE. The drainage condition in which consideration has been made for all loading deflections of the roof deck, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

REROOFING. The process of recovering or replacing an existing roof covering. See “Roof recover” and “Roof replacement.”

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof deck, vapor retarder, substrate or thermal barrier, insulation, vapor retarder and roof covering.

ROOF COVERING. The covering applied to the roof deck for weather resistance, fire classification or appearance.

ROOF COVERING SYSTEM. See "Roof assembly."

ROOF DECK. The flat or sloped surface not including its supporting members or vertical supports.

ROOF RECOVER. The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

ROOF REPLACEMENT. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

ROOF VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, attics, cathedral ceilings or other enclosed spaces over which a roof assembly is installed.

ROOFTOP STRUCTURE. An enclosed structure on or above the roof of any part of a building.

SCUPPER. An opening in a wall or parapet that allows water to drain from a roof.

SINGLE-PLY MEMBRANE. A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers.

UNDERLAYMENT. One or more layers of felt, sheathing paper, non-bituminous saturated felt or other approved material over which a steep-slope roof covering is applied.

SECTION 6.3
WEATHER PROTECTION

6.3.1 **General.** Roof decks shall be covered with approved roof coverings secured to the building or structure in accordance with the provisions of this chapter. Roof coverings shall be designed, installed and maintained in accordance with this code and the approved manufacturer's instructions such that the roof covering shall serve to protect the building or structure.

6.3.2 **Flashing.** Flashing shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane.

6.3.2.1 **Locations.** Flashing shall be installed at wall and roof intersections, at gutters, wherever there is a change in roof slope or direction and around roof openings. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than 0.483 mm (No. 26 galvanized sheet).

6.3.3 **Coping.** Parapet walls shall be properly coped with noncombustible, weatherproof materials of a width no less than the thickness of the parapet wall.

6.3.4 **Roof drainage.** Design and installation of roof drainage systems shall comply with the SBC 701.

6.3.4.1 **Gutters.** Gutters and leaders placed on the outside of buildings, other than Group R-3 as applicable in SBC 100, private garages and buildings of Type V construction, shall be of noncombustible material or a minimum of Schedule 40 plastic pipe.

6.3.5 **Roof ventilation.** Intake and exhaust vents shall be provided in accordance with Section 7.3.2 and the manufacturer's installation instructions.

SECTION 6.4
PERFORMANCE REQUIREMENTS

6.4.1 **Wind resistance of roofs.** Roof decks and roof coverings shall be designed for wind loads in accordance with SBC 301 and Sections 6.4.2, 6.4.3 and 6.4.4.

6.4.1.1 **Wind resistance of asphalt shingles.** Asphalt shingles shall be designed for wind speeds in accordance with Section 6.7.2.7.

6.4.2 **Wind resistance of clay and concrete tile.** Clay and concrete tile roof coverings shall be connected to the roof deck in accordance with SBC 301.

6.4.3 **Wind resistance of non-ballasted roofs.** Roof coverings installed on roofs in accordance with Section 6.7 that are mechanically attached or adhered to the roof deck shall be designed to resist the design wind load pressures for cladding in SBC 301.

6.4.3.1 **Other roof systems.** Roof systems with built-up, modified bitumen, fully adhered or mechanically attached single-ply through fastened metal panel roof systems, and other types of membrane roof coverings shall also be tested in accordance with FM 4450, FM 4470, UL 580 or UL 1897.

6.4.3.2 **Metal panel roof systems.** Metal panel roof systems through fastened or standing seam shall be tested in accordance with UL 580 or ASTM E 1592.

6.4.4 **Ballasted low-slope roof systems.** Ballasted low-slope (roof slope < 2:12) single-ply roof system coverings installed in accordance with Section 6.7 shall be designed in accordance with ANSI/SPRI RP-4.

6.4.5 **Edge securement for low-slope roofs.** Low-slope membrane roof systems metal edge securement, except gutters, installed in accordance with Section 6.7, shall be designed in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from SBC 301.

6.4.6 **Physical properties.** Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 6.7 shall demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G 152, ASTM G 155 or ASTM G 154. Those roof coverings that are subject to cyclical flexural response due to wind loads shall not demonstrate any significant loss of tensile strength for unreinforced membranes or breaking strength for reinforced membranes when

tested as herein required.

6.4.7 **Impact resistance.** Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 6.07 shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or FM 4470.

SECTION 6.5 FIRE CLASSIFICATION

6.5.1 **General.** Roof assemblies shall be divided into the classes defined below. Class A, B and C roof assemblies and roof coverings required to be listed by this section shall be tested in accordance with ASTM E 108 or UL 790. In addition, fire-retardant-treated wood roof coverings shall be tested in accordance with ASTM D 2898. The minimum roof coverings installed on buildings shall comply with Table 6.5.1 based on the type of construction of the building.

TABLE 6.5.1[a,b]
MINIMUM ROOF COVERING CLASSIFICATION FOR TYPES OF CONSTRUCTION

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	C[c]	B	C[c]	B	B	C[c]

a Unless otherwise required for Urban Wildland Interface or due to the location of the building within a fire district in accordance with SBC 801.

b Nonclassified roof coverings shall be permitted on buildings of Group R-3, as applicable in Section SBC 100, and Group U occupancies, where there is a minimum fire-separation distance of 1.8 meters measured from the leading edge of the roof.

c Buildings that are not more than two stories in height and having not more than 560 m^2 of projected roof area and where there is a minimum 3.0 meters fire-separation distance from the leading edge of the roof to a lot line on all sides of the building, except for street fronts or public ways, shall be permitted to have roofs of No. 1 cedar or redwood shakes and No. 1 shingles.

6.5.2 **Class A roof assemblies.** Class A roof assemblies are those that are effective against severe fire test exposure. Class A roof assemblies and roof coverings shall be listed and identified as Class A by - a local approved testing agency. Class A roof assemblies shall be permitted for use in buildings or structures of all types of construction.

Exception: Class A roof assemblies include those with coverings of brick, masonry, slate, clay or concrete roof tile, exposed concrete roof deck, ferrous or copper shingles or sheets.

6.5.3 **Class B roof assemblies.** Class B roof assemblies are those that are effective against moderate fire-test exposure. Class B roof assemblies and roof coverings shall be listed and identified as Class B by – a local approved testing agency.

Exception: Class B roof assemblies include those with coverings of metal sheets and shingles.

6.5.4 **Class C roof assemblies.** Class C roof assemblies are those that are effective against light fire-test exposure. Class C roof assemblies and roof coverings shall be listed and identified as Class C by – a local approved testing agency.

6.5.5 **Non-classified roofing.** Non-classified roofing is approved material that is not listed as a Class A, B or C roof covering.

6.5.6 **Fire-retardant-treated wood shingles and shakes.** Fire-retardant-treated wood shakes and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPA C1. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall also be labeled to identify the classification of the material in accordance with the testing required in Section 6.5.1, the treating company and the local quality control agency.

6.5.7 **Special purpose roofs.** Special purpose wood shingle or wood shake roofing shall conform with the grading and application requirements of Section 6.7.8 or 6.7.9. In addition, an underlayment of 16 mm Type X water-resistant gypsum backing board or gypsum sheathing shall be placed under minimum nominal 12.7 mm thick wood structural panel solid sheathing or 25 mm nominal spaced sheathing.

SECTION 6.6
MATERIALS

6.6.1 **Scope.** The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions. Installation of roof coverings shall comply with the applicable provisions of Section 6.7.

6.6.2 **Compatibility of materials.** Roofs and roof coverings shall be of materials that are compatible with each other and with the building or structure to which the materials are applied.

6.6.3 **Material specifications and physical characteristics.** Roof-covering materials shall conform to the applicable standards listed in this chapter. In the absence of applicable standards or where materials are of questionable suitability, testing by – a local approved agency shall be required by the local building official to determine the character, quality and limitations of application of the materials.

6.6.4 **Product identification.** Roof-covering materials shall be delivered in packages bearing the manufacturer's identifying marks and approved local testing agency labels required in accordance with Section 6.5. Bulk shipments of materials shall be accompanied with the same information issued in the form of a certificate or on a bill of lading by the manufacturer.

SECTION 6.7
REQUIREMENTS FOR ROOF COVERINGS

6.7.1 **Scope.** Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

6.7.2 **Asphalt shingles.** The installation of asphalt shingles shall comply with the provisions of this section and Table 6.7.2.

6.7.2.1 **Deck requirements.** Asphalt shingles shall be fastened to solidly sheathed decks.

6.7.2.2 **Slope.** Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (17 percent slope) or greater. For roof slopes from two units vertical in 12 units horizontal (17-percent slope) up to four units vertical in 12 units horizontal (33 percent slope), double underlayment application is required in accordance with Section 6.7.2.8.

6.7.2.3 **Underlayment.** Unless otherwise noted, required underlayment shall conform to ASTM D 226, Type I, or ASTM D 4869, Type I.

6.7.2.4 **Self-adhering polymer modified bitumen sheet.** Self-adhering polymer modified bitumen sheet shall comply with ASTM D 1970.

6.7.2.5 **Asphalt shingles.** Asphalt shingles shall have self-seal strips or be interlocking, and comply with ASTM D 225 or ASTM D 3462.

6.7.2.6 **Fasteners.** Fasteners for asphalt shingles shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 2.67 mm (12 gage) shank with a minimum 9.5 mm diameter head, of a length to penetrate through the roofing materials and a minimum of 19 mm into the roof sheathing. Where the roof sheathing is less than 19 mm thick, the nails shall penetrate through the sheathing. Fasteners shall comply with ASTM F 1667.

6.7.2.7 **Attachment.** Asphalt shingles shall have the minimum number of fasteners required by the manufacturer and Section 6.4.1. Asphalt shingles shall be secured to the roof with not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 20 units vertical in 12 units horizontal (166 percent slope), special methods of fastening are required. For roofs located where the basic wind speed in accordance with SBC 301 is 175 km/h or greater, special methods of fastening are required. Special fastening methods shall be tested in accordance with ASTM D 3161, modified to use a wind speed of 175 km/h.

TABLE 6.7.2
ASPHALT SHINGLE APPLICATION

COMPONENT	INSTALLATION REQUIREMENT
1. Roof slope	Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (2:12) or greater. For roof slopes from two units vertical in 12 units horizontal (2:12) up to four units vertical in 12 units horizontal (4:12), double underlayment application is required in accordance with Section 6.7.2.8.
2. Deck requirement	Asphalt shingles shall be fastened to solidly sheathed roofs.
3. Underlayment	Underlayment shall conform with ASTM D 226, Type 1, or ASTM D 4869, Type 1.
For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12)	Underlayment shall be two layers applied in the following manner. Apply a minimum 480 mm strip or underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 890 mm-wide sheets of underlayment overlapping successive sheets 480 mm and fastened sufficiently to hold in place.
For roof slopes from four units vertical in 12 units horizontal (4:12) or greater	Underlayment shall be one layer applied in the following manner. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 50 mm, fastened only as necessary to hold in place.
4. Application	—
Attachment	Asphalt shingles shall have the minimum number of fasteners required by the manufacturer and Section 6.4.1. Asphalt shingles shall be secured to the roof with not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 20 units vertical in 12 units horizontal (20:12), special methods of fastening are required.
Fasteners	Galvanized, stainless steel, aluminum or copper roofing nails, minimum 12-gage (2.67 mm) shank with a minimum 9.5 mm diameter head. Fasteners shall be long enough to penetrate into the sheathing 19 mm or through the thickness of the sheathing.
Flashings	In accordance with Section 6.7.2.9.

6.7.2.8 Underlayment application. For roof slopes from two units vertical in 12 units horizontal (17 percent slope), up to four units vertical in 12 units horizontal (33-percent slope), underlayment shall be two layers applied in the following manner. Apply a minimum 480 mm wide strip of underlayment felt parallel with and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 900 mm wide sheets of underlayment overlapping successive sheets 480 mm and fastened sufficiently to hold in place. For roof slopes of four units vertical in 12 units horizontal (33 percent slope) or greater, underlayment shall be one layer applied in the following manner. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 50 mm, fastened only as necessary to hold in place.

6.7.2.8.1 High wind attachment. Underlayment applied in areas subject to high winds (greater than 175 km/h in accordance with SBC 301 shall be applied with corrosion resistant fasteners in accordance with the manufacturer's instructions. Fasteners are to be applied along the overlap at a maximum spacing of 900 mm on center.

6.7.2.8.2 Ice dam membrane. Not applicable in the Kingdom.

6.7.2.9 Flashings. Flashing for asphalt shingles shall comply with this section. Flashing shall be applied in accordance with this section and the asphalt shingle manufacturer's printed instructions.

6.7.2.9.1 Base and cap flashing. Base and cap flashing shall be installed in accordance with the manufacturer's instructions. Base flashing shall be of either corrosion resistant metal of minimum nominal 0.483 mm thickness or mineral-surfaced roll roofing weighing a minimum of 3.76 kg/m^2. Cap flashing shall be corrosion-resistant metal of minimum nominal 0.483 mm thickness.

6.7.2.9.2 Valleys. Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles. Valley linings of the following types shall be permitted:

1. For open valleys (valley lining exposed) lined with metal, the valley lining shall be at least 400 mm wide and of any of the corrosion-resistant metals in Table 6.7.2.9.2.
2. For open valleys, valley lining of two plies of mineral-surfaced roll roofing shall be permitted. The bottom layer shall be 450 mm and the top layer a minimum of 900 mm wide.
3. For closed valleys (valleys covered with shingles), valley lining of one ply of smooth roll roofing complying with ASTM D 224 and at least 900 mm wide or types as described in Items 1 and 2 above shall be permitted. Specialty underlayment shall comply with ASTM D 1970.

TABLE 6.7.2.9.2
VALLEY LINING MATERIAL

MATERIAL	MINIMUM THICKNESS	GAGE	WEIGHT
Copper	—	—	454 g
Aluminum	0.61 mm	—	—
Stainless steel	—	28	—
Galvanized steel	0.455 mm	26 (zinc-coated G90)	—
Zinc alloy	0.686 mm	—	—
Lead	—	—	1.135 kg
Painted terne	—	—	9.08 kg

6.7.2.9.3 Drip edge. Provide drip edge at eaves and gables of shingle roofs. Overlap to be a minimum of 50 mm. Eave drip edges shall extend 6.4 mm below sheathing and extend back on the roof a minimum of 50 mm. Drip edge shall be mechanically

fastened a maximum of 300 mm o.c. A cricket or saddle shall be installed on the ridge side of any chimney greater than 750 mm wide. Cricket or saddle coverings shall be sheet metal or of the same material as the roof covering.

6.7.3 **Clay and concrete tile.** The installation of clay and concrete tile shall comply with the provisions of this section.

6.7.3.1 **Deck requirements.** Concrete and clay tile shall be installed only over solid sheathing or spaced structural sheathing boards.

6.7.3.2 **Deck slope.** Clay and concrete roof tile shall be installed on roof slopes of $2^1/_2$ units vertical in 12 units horizontal (21 percent slope) or greater. For roof slopes from $2^1/_2$ units vertical in 12 units horizontal (21 percent slope) to four units vertical in 12 units horizontal (33 percent slope), double underlayment application is required in accordance with Section 6.7.3.3.

6.7.3.3 **Underlayment.** Unless otherwise noted, required underlayment shall conform to: ASTM D 226, Type II; ASTM D 2626 or ASTM D 249 Type I mineral-surfaced roll roofing.

6.7.3.3.1 **Low-slope roofs.** For roof slopes from $2^1/_2$ units vertical in 12 units horizontal (21 percent slope), up to four units vertical in 12 units horizontal (33 percent slope), underlayment shall be a minimum of two layers applied as follows:

1. Starting at the eave, a 480 mm strip of underlayment shall be applied parallel with the eave and fastened sufficiently in place.
2. Starting at the eave, 900 mm wide strips of underlayment felt shall be applied overlapping successive sheets 480 mm and fastened sufficiently in place.

6.7.3.3.2 **High-slope roofs.** For roof slopes of four units vertical in 12 units horizontal (33 percent slope) or greater, underlayment shall be a minimum of one layer of underlayment felt applied shingle fashion, parallel to, and starting from the eaves and lapped 50 mm, fastened only as necessary to hold in place.

6.7.3.4 **Clay tile.** Clay roof tile shall comply with ASTM C 1167.

6.7.3.5 **Concrete tile.** Concrete roof tiles shall be in accordance with the physical test requirements as follows:

1. The transverse strength of tiles shall be determined according to Section 6.3 of ASTM C 1167 and in accordance with Table 6.7.3.5.
2. The absorption of concrete roof tiles shall be according to Section 8 of ASTM C 140. Roof tiles shall absorb not more than 15 percent of the dry weight of the tile during a 24 hours immersion test.
3. Roof tiles shall be tested for freeze/thaw resistance according to Section 8 of ASTM C67. Roof tiles shall show no breakage and not have more than 1 percent loss in dry weight of any individual concrete roof tile.

TABLE 6.7.3.5
TRANSVERSE BREAKING STRENGTH OF CONCRETE ROOF TILE

TILE PROFILE	DRY	
	Average of five tiles	**Individual tile**
High profile	182 N	159 N
Medium profile	136 N	114 N
Flat profile	136 N	114 N

6.7.3.6 **Fasteners.** Tile fasteners shall be corrosion resistant and not less than 11 gage, 8.0 mm head, and of sufficient length to penetrate the deck a minimum of 19 mm or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 2.1 mm. Perimeter fastening areas include three tile courses but not less than 900 mm from either side of hips or ridges and

edges of eaves and gable rakes.

6.7.3.7 **Attachment.** Clay and concrete roof tiles shall be fastened in accordance with Table 6.7.3.7.

6.7.3.8 **Application.** Tile shall be applied according to the manufacturer's installation instructions, based on the following:

1. Climatic conditions.
2. Roof slope.
3. Underlayment system.
4. Type of tile being installed.

6.7.3.9 **Flashing.** At the juncture of the roof vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall not be less than 0.48 mm (No. 26 galvanized sheet gage) corrosion-resistant. The valley flashing shall extend at least 280 mm from the centerline each way and have a splash diverter rib not less than 25 mm high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 100 mm. For roof slopes of three units vertical in 12 units horizontal (25 percent slope) and over, the valley flashing shall have a 900 mm wide underlayment of one layer of Type I underlayment running the full length of the valley, in addition to other required underlayment.

6.7.4 **Metal roof panels.** The installation of metal roof panels shall comply with the provisions of this section.

6.7.4.1 **Deck requirements.** Metal roof panel roof coverings shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced supports.

6.7.4.2 **Deck slope.** The minimum slope for lapped, non-soldered seam metal roofs without applied lap sealant shall be three units vertical in 12 units horizontal (25 percent slope). The minimum slope for lapped, non-soldered seam metal roofs with applied lap sealant shall be one-half vertical unit in 12 units horizontal (4-percent slope). The minimum slope for standing seam of roof systems shall be one-quarter unit vertical in 12 units horizontal (2 percent slope).

6.7.4.3 **Material standards.** Metal-sheet roof covering systems that incorporate supporting structural members shall be designed in accordance with SBC 306. Metal-sheet roof coverings installed over structural decking shall comply with Table 6.7.4.3.

6.7.4.4 **Attachment.** Metal roofing fastened directly to steel framing shall be attached by approved manufacturer's fasteners. In the absence of manufacturer recommendations, all of the following fasteners shall be used:

1. Galvanized fasteners shall be used for galvanized roofs.
2. 300 series stainless-steel fasteners shall be used for copper roofs.
3. Stainless-steel fasteners are acceptable for all types of metal roofs.

6.7.5 **Metal roof shingles.** The installation of metal roof shingles shall comply with the provisions of this section.

6.7.5.1 **Deck requirements.** Metal roof shingles shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced sheathing.

6.7.5.2 **Deck slope.** Metal roof shingles shall not be installed on roof slopes below three units vertical in 12 units horizontal (25-percent slope).

6.7.5.3 **Underlayment.** Underlayment shall conform to ASTM D 226, Type I.

Exception: Detached accessory structures that contain no conditioned floor area.

Table 6.7.3.7
Clay and Concrete Tile Attachment[a,b,c]

General – Clay or Concrete Roof Tile

Maximum basic wind speed (Km/h)	Mean roof height (meters)	Roof slope up to < 3:12	Roof slope 3:12 and over
137	0-18.3	Flat tile without vertical laps, two fasteners per tile.	Two fasteners per tile. Only one fastener on slopes of 7:12 and less for tiles with installed weight exceeding 0.36 kN/m^2 having a width no greater than 400 mm.
160	0-12.2		
160	> 12.2-18.3	The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails. The nose of all ridge, hip and rake tiles shall be set in a bead of roofer's mastic.	
177	0-18.3	The fastening system shall resist the wind forces in SBC 301.	
193	0-18.3	The fastening system shall resist the wind forces in SBC 301.	
209	0-18.3	The fastening system shall resist the wind forces in SBC 301.	
All	0-18.3	The fastening system shall resist the wind forces in SBC 301.	

Interlocking clay or concrete roof tile with projecting anchor lugs[d, e]
(Installations on spaced/solid sheathing with battens or spaced sheathing)

Maximum basic wind speed (Km/h)	Mean roof height (meters)	Roof slope up to < 5:12	Roof slope 5:12 < 12:12	Roof slope 5:12 < 12:12
137	0-18.3	Fasteners are not required. Tiles with installed weight less than 0.43 kN/m^2 require a minimum of one fastener per tile.	One fastener per tile every other row. All perimeter tiles require one fastener. Tiles with installed weight less than 0.43 kN/m^2 require a minimum of one fastener per tile.	One fastener required for every tile. Tiles with installed weight less than 0.43 kN/m^2 require a minimum of one fastener per tile.
160	0-12.2			
160	> 12.2-18.3	The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails The nose of all ridge, hip and rake tiles shall be set in a bead of roofers's mastic.		
177	0-18.3	The fastening system shall resist the wind forces in SBC 301.		
193	0-18.3	The fastening system shall resist the wind forces in SBC 301.		
209	0-18.3	The fastening system shall resist the wind forces in SBC 301.		
All	0-18.3	The fastening system shall resist the wind forces in SBC 301.		

Interlocking clay or concrete roof tile with projecting anchor lugs
(Installations on solid sheathing without battens)

Maximum basic wind speed (km/h)	Mean roof height (meters)	All roof slopes
137	0-18.3	One fastener per tile.
160	0-12.2	One fastener per tile.
160	> 12.2-18.3	The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails The nose of all ridge, hip and rake tiles shall be set in a bead of roofers's mastic.
177	0-18.3	The fastening system shall resist the wind forces in SBC 301.
193	0-18.3	The fastening system shall resist the wind forces in SBC 301.
209	0-18.3	The fastening system shall resist the wind forces in SBC 301.
All	0-18.3	The fastening system shall resist the wind forces in SBC 301.

a. Minimum fastener size. Corrosion-resistant nails not less than No. 11 gage with 8 mm head. Fasteners shall be long enough to penetrate into the sheathing 19 mm or through the thickness of the sheathing, whichever is less. Attaching wire for clay and concrete tile shall not be smaller than 2 mm.
b. Snow areas. A minimum of two fasteners per tile are required or battens and one fastener.
c. Roof slopes greater than 24:12. The nose of all tiles shall be securely fastened.
d. Horizontal battens. Battens shall be not less than 25 by 50 mm nominal. Provisions shall be made for drainage by a minimum of 3.2 mm riser at each nail or by 4 foot-long battens with at least a 12.7 mm separation between battens. Horizontal battens are required for slopes over 7:12.
e. Perimeter fastening areas include three tile courses but not less than 900 mm from either side of hips or ridges and edges of eaves and gable rakes.

6.7.5.4 **Material standards.** Metal roof shingle roof coverings shall comply with Table 6.7.4.3.

6.7.5.5 **Attachment.** Metal roof shingles shall be secured to the roof in accordance with the approved manufacturer's installation instructions.

6.7.5.6 **Flashing.** Roof valley flashing shall be of corrosion-resistant metal of the same material as the roof covering or shall comply with the standards in Table 6.7.4.3. The valley flashing shall extend at least 200 mm from the centerline each way and shall have a splash diverter rib not less than 19 mm high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 100 mm.

TABLE 6.7.4.3
METAL ROOF COVERINGS

ROOF COVERING TYPE	STANDARD APPLICATION RATE/THICKNESS
Aluminum	ASTM B 209, 0.61 mm minimum thickness for roll-formed panels and 0.48 mm minimum thickness for press-formed shingles.
Aluminum-zinc alloy coated steel	ASTM A 792 AZ 50
Copper	0.0416 kg/m^2 for metal-sheet roof-covering systems; 0.0312 kg/m^2 for preformed metal shingle systems.
Galvanized steel	ASTM A 653 G-90 zinc-coated, 0.33 mm thick minimum
Lead-coated copper	ASTM B 101
Hard lead	9.764 kg/m^2
Soft lead	14.646 kg/m^2
Prepainted steel	ASTM A 755
Terne (tin) and terne-coated stainless	Terne coating of 18.16 kg per double base box, field painted where applicable in accordance with manufacturer's installation instructions.

6.7.6 **Mineral-surfaced roll roofing.** The installation of mineral-surfaced roll roofing shall comply with this section.

6.7.6.1 **Deck requirements.** Mineral-surfaced roll roofing shall be fastened to solidly sheathed roofs.

6.7.6.2 **Deck slope.** Mineral-surfaced roll roofing shall not be applied on roof slopes below one unit vertical in 12 units horizontal (8 percent slope).

6.7.6.3 **Underlayment.** Underlayment shall conform to ASTM D 226, Type I.
Exception: Detached accessory structures that contain no conditioned floor area.

6.7.6.4 **Material standards.** Mineral-surfaced roll roofing shall conform to ASTM D 224, ASTM D 249, ASTM D 371 or ASTM D 3909.

6.7.7 **Slate shingles.** The installation of slate shingles shall comply with the provisions of this section.

6.7.7.1 **Deck requirements.** Slate shingles shall be fastened to solidly sheathed roofs.

6.7.7.2 **Deck slope.** Slate shingles shall only be used on slopes of four units vertical in 12 units horizontal (4:12) or greater.

6.7.7.3 **Underlayment.** Underlayment shall comply with ASTM D 226, Type II.
Exception: Detached accessory structures that contain no conditioned floor area.

6.7.7.4 **Material standards.** Slate shingles shall comply with ASTM C 406.

6.7.7.5 **Application.** Minimum headlap for slate shingles shall be in accordance with Table 6.7.7.5. Slate shingles shall be secured to the roof with two fasteners per slate.

TABLE 6.7.7.5
SLATE SHINGLE HEADLAP

SLOPE	HEADLAP
4:12 < slope < 8:12	100 mm
8:12 < slope < 20:12	75 mm
slope ≥ 20:12	50 mm

6.7.7.6 **Flashing.** Flashing and counterflashing shall be made with sheet metal. Valley flashing shall be a minimum of 380 mm wide. Valley and flashing metal shall be a minimum uncoated thickness of 0.455 mm zinc-coated G90. Chimneys, stucco or brick walls shall have a minimum of two plies of felt for a cap flashing consisting of a 100 mm wide strip of felt set in plastic cement and extending 25 mm above the first felt and a top coating of plastic cement. The felt shall extend over the base flashing 50 mm.

6.7.8 **Wood shingles.** The installation of wood shingles shall comply with the provisions of this section and Table 6.7.8.

6.7.8.1 **Deck requirements.** Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 25 mm by 100 mm nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners.

6.7.8.1.1 **Solid sheathing required.** Solid sheathing is required in areas where the average daily temperature in January is -4°C (25°F) or less or where there is a possibility of ice forming along the eaves causing a backup of water.

6.7.8.2 **Deck slope.** Wood shingles shall be installed on slopes of three units vertical in 12 units horizontal (25 percent slope) or greater.

6.7.8.3 **Underlayment.** Underlayment shall comply with ASTM D 226, Type I.
Exception: Detached accessory structures that contain no conditioned floor area.

6.7.8.4 **Material standards.** Wood shingles shall be of naturally durable wood and comply with the requirements of Table 6.7.8.4.

6.7.8.5 **Attachment.** Fasteners for wood shingles shall be corrosion resistant with a minimum penetration of 19 mm into the sheathing. For sheathing less than 12.7 mm in thickness, the fasteners shall extend through the sheathing. Each shingle shall be attached with a minimum of two fasteners.

6.7.8.6 **Application.** Wood shingles shall be laid with a side lap not less than 38 mm between joints in adjacent courses, and not be in direct alignment in alternate courses. Spacing between shingles shall be 6.4 to 9.5 mm. Weather exposure for wood shingles shall not exceed that set in Table 6.7.8.6.

6.7.8.7 **Flashing.** At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall not be less than 0.48 mm (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 280 mm from the centerline each way and have a splash diverter rib not less than 25 mm high at the flow lineformed as part of the flashing. Sections of flashing shall have an end lap of not less than 100 mm. For roof slopes of three

units vertical in 12 units horizontal (25 percent slope) and over, the valley flashing shall have a 900 mm wide underlayment of one layer of Type I underlayment running the full length of the valley, in addition to other required underlayment.

TABLE 6.7.8
WOOD SHINGLE AND SHAKE INSTALLATION

ROOF ITEM	WOOD SHINGLES	WOOD SHAKES
1. Roof slope	Wood shingles shall be installed on slopes of three units vertical in 12 units horizontal (3:12) or greater.	Wood shakes shall be installed on slopes of four units vertical in 12 units horizontal (4:12) or greater.
2. Deck requirement	—	—
Temperate climate	Shingles shall be applied to roofs with solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 25 mm × 100 mm nominal dimensions and shall be spaced on center equal to the weather exposure to coincide with the placement of fasteners.	Shakes shall be applied to roofs with solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 25 mm × 100 mm nominal dimensions and shall be spaced on center equal to the weather exposure to coincide with the placement of fasteners. When 25 mm × 100 mm spaced sheathing is installed at 10 inches, boards must be installed between the sheathing boards.
3. Interlayment	No requirements.	Interlayment shall comply with ASTM D 226, Type 1.
4. Underlayment	—	—
Temperate climate	Underlayment shall comply with ASTM D 226, Type 1.	Underlayment shall comply with ASTM D 226, Type 1.
5. Application	—	—
Attachment	Fasteners for wood shingles shall be corrosion resistant with a minimum penetration of 19 mm into the sheathing. For sheathing less than 12.7 mm thick, the fasteners shall extend through the sheathing.	Fasteners for wood shakes shall be corrosion resistant with a minimum penetration of 19 mm into the sheathing. For sheathing less than 12.7 mm thick, the fasteners shall extend through the sheathing.
No. of fasteners	Two per shingle.	Two per shake.
Exposure	Weather exposures shall not exceed those set forth in Table 6.7.8.6	Weather exposures shall not exceed those set forth in Table 6.7.9.7
Method	Shingles shall be laid with a side lap of not less than 38 mm between joints in courses, and no two joints in any three adjacent courses shall be in direct alignment. Spacing between shingles shall be 6.4 to 9.5 mm.	Shakes shall be laid with a side lap of not less than 38 mm between joints in adjacent courses. Spacing between shakes shall not be less than 9.5 mm or more than 16 mm for shakes and tapersawn shakes of naturally durable wood and shall be 6.4 to 9.5 mm for preservative taper sawn shakes.
Flashing	In accordance with Section 6.7.8.7.	In accordance with Section 6.7.9.8.

TABLE 6.7.8.4
WOOD SHINGLE MATERIAL REQUIREMENTS

MATERIAL	APPLICABLE MINIMUM GRADES	GRADING RULES
Wood shingles of naturally durable wood	1, 2 or 3	CSSB

CSSB = Cedar Shake and Shingle Bureau

TABLE 6.7.8.6
WOOD SHINGLE WEATHER EXPOSURE AND ROOF SLOPE

ROOFING MATERIAL	LENGTH	GRADE	EXPOSURE 3:12 pitch to < 4:12	EXPOSURE 4:12 pitch or steeper
Shingles of naturally durable wood	400mm	No. 1	95 mm	125 mm
		No. 2	90 mm	100 mm
		No. 3	75 mm	90 mm
	450 mm	No. 1	108 mm	140 mm
		No. 2	100 mm	115 mm
		No. 3	90 mm	100 mm
	600 mm	No. 1	145 mm	190 mm
		No. 2	140 mm	165 mm
		No. 3	125 mm	140 mm

6.7.9 **Wood shakes.** The installation of wood shakes shall comply with the provisions of this section and Table 6.7.8.

6.7.9.1 **Deck requirements.** Wood shakes shall only be used on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 25 mm by 100 mm nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Where 25 mm by 100 mm spaced sheathing is installed at 250 mm o.c., additional 25 mm by 100 mm boards shall be installed between the sheathing boards.

6.7.9.2 **Deck slope.** Wood shakes shall only be used on slopes of four units vertical in 12 units horizontal (33 percent slope) or greater.

6.7.9.3 **Underlayment.** Underlayment shall comply with ASTM D 226, Type I.

Exception: Detached accessory structures that contain no conditioned floor area.

6.7.9.4 **Interlayment.** Interlayment shall comply with ASTM D 226, Type I.

6.7.9.5 **Material standards.** Wood shakes shall comply with the requirements of Table 6.7.9.5.

6.7.9.6 **Attachment.** Fasteners for wood shakes shall be corrosion resistant with a minimum penetration of 19 mm into the sheathing. For sheathing less than 12.7 mm in thickness, the fasteners shall extend through the sheathing. Each shake shall be attached with a minimum of two fasteners.

6.7.9.7 **Application.** Wood shakes shall be laid with a side lap not less than 38 mm between joints in adjacent courses. Spacing between shakes in the same course shall be 9.5 to 16 mm for shakes and taper sawn shakes of naturally durable wood and shall be 6.4 to 9.5 mm for preservative taper sawn shakes. Weather exposure for wood shakes shall not exceed those set in Table 6.7.9.7.

TABLE 6.7.9.5
WOOD SHAKE MATERIAL REQUIREMENTS

MATERIAL	MINIMUM GRADES	APPLICABLE GRADING RULES
Wood shakes of naturally durable wood	1	CSSB
Taper sawn shakes of naturally durable wood	1 or 2	CSSB
Preservative-treated shakes and shingles of naturally durable wood	1	CSSB
Fire-retardant-treated shakes and shingles of naturally durable wood	1	CSSB
Preservative-treated taper sawn shakes of Southern yellow pine treated in accordance with AWPA Standard C2	1 or 2	TFS

TFS = Forest Products Laboratory of the Texas Forest Services.

6.7.9.8 **Flashing.** At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall not be less than 0.48 mm (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 280 mm from the centerline each way and have a splash diverter rib not less than 25 mm high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 100 mm. For roof slopes of 3 units vertical in 12 units horizontal (25 percent slope) and over, the valley flashing shall have a 900 mm-wide underlayment of one layer of Type I underlayment running the full length of the valley, in addition to other required underlayment.

6.7.10 **Built-up roofs.** The installation of built-up roofs shall comply with the provisions of this section.

6.7.10.1 **Slope.** Built-up roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2 percent slope) for drainage, except for coal-tar built-up roofs that shall have a design slope of a minimum one-eighth unit vertical in 12 units horizontal (1 percent slope).

6.7.10.2 **Material standards.** Built-up roof covering materials shall comply with the standards in Table 6.7.10.2.

6.7.11 **Modified bitumen roofing.** The installation of modified bitumen roofing shall comply with the provisions of this section.

6.7.11.1 Slope. Modified bitumen membrane roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2 percent slope) for drainage.

6.7.11.2 **Material standards.** Modified bitumen roof coverings shall comply with CGSB 37-GP-56M, ASTM D 6162, ASTM D 6163, ASTM D 6164, ASTM D 6222, ASTM D 6223 and ASTM D 6298.

6.7.12 **Thermoset single-ply roofing.** The installation of thermoset single-ply roofing shall comply with the provisions of this section.

6.7.12.1 **Slope.** Thermoset single-ply membrane roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2 percent slope) for drainage.

6.7.12.2 **Material standards.** Thermoset single-ply roof coverings shall comply with RMA RP-1, RP-2 or RP-3, or ASTM D 4637, ASTM D 5019 or CGSB 37-GP-52M.

TABLE 6.7.9.7
WOOD SHAKE WEATHER EXPOSURE AND ROOF SLOPE

ROOFING MATERIAL	LENGTH	GRADE	EXPOSURE 4:12 PITCH OR STEEPER
Shakes of naturally durable wood	450 mm 600 mm	No. 1 No. 1	190 mm 250 mm [a]
Preservative-treated taper sawn shakes of Southern yellow pine	450 mm 600 mm	No. 1 No. 1	190 mm 250 mm
	450 mm 600 mm	No. 2 No. 2	140 mm 190 mm
Taper sawn shakes of naturally durable wood	450 mm 600 mm	No. 1 No. 1	190 mm 250 mm
	450 mm 600 mm	No. 2 No. 2	140 mm 190 mm

[a] For 600 mm by 9.5 mm handsplit shakes, the maximum exposure is 190 mm.

6.7.13 **Thermoplastic single-ply roofing.** The installation of thermoplastic single-ply roofing shall comply with the provisions of this section.

6.7.13.1 **Slope.** Thermoplastic single-ply membrane roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2 percent slope).

6.7.13.2 **Material standards.** Thermoplastic single-ply roof coverings shall comply with ASTM D 4434 or CGSB 37-GP-54M.

6.7.14 **Sprayed polyurethane foam roofing.** The installation of sprayed polyurethane foam roofing shall comply with the provisions of this section.

6.7.14.1 **Slope.** Sprayed polyurethane foam roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2 percent slope) for drainage.

6.7.14.2 **Material standards.** Spray-applied polyurethane foam insulation shall comply with ASTM C 1029.

6.7.14.3 **Application.** Foamed-in-place roof insulation shall be installed in accordance with the manufacturer's instructions. A liquid-applied protective coating that complies with Section 6.7.15 shall be applied no less than 2 hours nor more than 72 hours following the application of the foam.

6.7.14.4 **Foam plastics.** Foam plastic materials and installation shall comply with Chapter 11.

6.7.15 **Liquid-applied coatings.** The installation of liquid-applied coatings shall comply with the provisions of this section.

6.7.15.1 **Slope.** Liquid-applied roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2 percent slope).

6.7.15.2 **Material standards.** Liquid-applied roof coatings shall comply with ASTM C 836, ASTM C 957, ASTM D 6083, ASTM D 1227 or ASTM D 3468.

SECTION 6.8
ROOF INSULATION

6.8.1 **General.** The use of above-deck thermal insulation shall be permitted provided such insulation is covered with an approved roof covering and passes the tests of FM 4450 or UL 1256 when tested as an assembly.

Exception: Foam plastic roof insulation shall conform to the material and installation requirements of Chapter 11.

6.8.1.1 **Cellulosic fiberboard.** Cellulosic fiberboard roof insulation shall conform to an approved material and installation.

TABLE 6.7.10.2
BUILT-UP ROOFING MATERIAL STANDARDS

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D 6083
Aggregate surfacing	ASTM D 1863
Asphalt adhesive used in roofing	ASTM D 3747
Asphalt cements used in roofing	ASTM D 3019; D 2822; D 4586
Asphalt-coated glass fiber base sheet	ASTM D 4601
Asphalt coatings used in roofing	ASTM D1227; D 2823; D 4479
Asphalt glass felt	ASTM D 2178
Asphalt primer used in roofing	ASTM D 41
Asphalt-saturated and asphalt-coated organic felt base sheet	ASTM D 2626
Asphalt-saturated organic felt (perforated)	ASTM D 226
Asphalt used in roofing	ASTM D 312
Coal-tar cements used in roofing	ASTM D 4022; D 5643
Coal-tar saturated organic felt	ASTM D 227
Coal-tar pitch used in roofing	ASTM D 450; Type I or II
Coal-tar primer used in roofing, dampproofing and waterproofing	ASTM D 43
Glass mat, coal tar	ASTM D 4990
Glass mat, venting type	ASTM D 4897
Mineral-surfaced inorganic cap sheet	ASTM D 3909
Thermoplastic fabrics used in roofing	ASTM D 5665, D 5726

SECTION 6.9
ROOFTOP STRUCTURES

6.9.1 **General.** The provisions of this section shall govern the construction of rooftop structures.

6.9.2 **Penthouses.** A penthouse or other projection above the roof in structures of other than Type I construction shall not exceed 8.5 meters above the roof where used as an enclosure for tanks or for elevators that run to the roof and in all other cases shall not extend more than 8.5 meters above the roof. The aggregate area of penthouses and other rooftop structures shall not exceed one-third the area of the supporting roof. A penthouse, bulkhead or any other similar projection above the roof shall not be used for purposes other than shelter of mechanical equipment or shelter of vertical shaft openings in the roof. Provisions such as louvers, louver blades or flashing shall be made to protect the mechanical equipment and the building interior from the elements. Penthouses or bulkheads used for purposes other than permitted by this section shall conform to the requirements of this code for an additional story. The restrictions of this section shall not prohibit the placing of wood flagpoles or similar structures on the roof of any building.

6.9.2.1 **Type of construction.** Penthouses shall be constructed with walls, floors and roof as required for the building.

Exceptions:

1. On buildings of Type I and II construction, the exterior walls and roofs of penthouses with a fire separation distance of more than 1.5 meters and less than 6.1 meters shall be of at least 1-hour fire-resistance-rated noncombustible

construction. Walls and roofs with a fire separation distance of 6.1 meters or greater shall be of noncombustible construction. Interior framing and walls shall be of noncombustible construction.

2. On buildings of Type III, IV and V construction, the exterior walls of penthouses with a fire separation distance of more than 1.5 meters and less than 6.1 meters shall be at least 1-hour fire-resistance-rated construction. Walls with a fire separation distance of 6.1 meters or greater from a common property line shall be of Type IV or noncombustible construction. Roofs shall be constructed of materials and fire-resistance rated as required in Table 4.1. Interior framing and walls shall be Type IV or noncombustible construction.

3. Unprotected noncombustible enclosures housing only mechanical equipment and located with a minimum fire separation distance of 6.1 meters shall be permitted.

4. On one-story buildings, combustible unroofed mechanical equipment screens, fences or similar enclosures are permitted where located with a fire separation distance of at least 6.1 meters from adjacent property lines and where not exceeding 1.2 meters in height above the roof surface.

5. Dormers shall be of the same type of construction as the roof on which they are placed, or of the exterior walls of the building.

6.9.3 **Tanks.** Tanks having a capacity of more than 2.0 m^3 placed in or on a building shall be supported on masonry, reinforced concrete, steel or Type IV construction provided that, where such supports are located in the building above the lowest story, the support shall be fire-resistance rated as required for Type IA construction.

6.9.3.1 **Valve.** Such tanks shall have in the bottom or on the side near the bottom, a pipe or outlet, fitted with a suitable quick opening valve for discharging the contents in an emergency through an adequate drain.

6.9.3.2 **Location.** Such tanks shall not be placed over or near a line of stairs or an elevator shaft, unless there is a solid roof or floor underneath the tank.

6.9.3.3 **Tank cover.** Unenclosed roof tanks shall have covers sloping toward the outer edges.

6.9.4 **Cooling towers.** Cooling towers in excess of 23.0 m^2 in base area or in excess of 4600 mm high where located on buildings more than 15.3 meters high shall be of noncombustible construction. Cooling towers shall not exceed one-third of the supporting roof area.

Exception: Drip boards and the enclosing construction of wood not less than 25 mm nominal thickness, provided the wood is covered on the exterior of the tower with noncombustible material.

6.9.5 **Towers, spires, domes and cupolas.** Any tower, spire, dome or cupola shall be of a type of construction not less in fire-resistance rating than required for the building to which it is attached except that any such tower, spire, dome or cupola that exceeds 25.0 meters in height above grade, or exceeds 18.5 m^2 in horizontal area or is used for any purpose other than a minerate or an architectural embellishment shall be constructed of and supported on Type I or II construction.

6.9.5.1 **Noncombustible construction required.** Any tower, spire, dome or cupola that exceeds 18.3 meters in height above the highest point at which it comes in contact with the roof, or that exceeds 18.5 m^2 in area at any horizontal section, or which is intended to be used for any purpose other than a minerate or architectural embellishment, shall be entirely constructed of and supported by noncombustible

materials. Such structures shall be separated from the building below by construction having a fire-resistance rating of not less than 1.5 hours with openings protected with a minimum 1.5-hour fire-protection rating. Structures, except aerial supports 3.7 meters high or less, flagpoles, water tank and cooling towers, placed above the roof of any building more than 15.3 meters in height, shall be of noncombustible material and shall be supported by construction of noncombustible material.

6.9.5.2 **Towers and spires.** Towers and spires where enclosed shall have exterior walls as required for the building to which they are attached. The roof covering of spires shall be of a class of roof covering as required for the main roof of the rest of the structure.

SECTION 6.10
REROOFING

6.10.1 **General.** Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 6.

Exception: Reroofing shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2 percent slope) in Section 6.7 for roofs that provide positive roof drainage.

6.10.2 **Structural and construction loads.** Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

6.10.3 **Recovering versus replacement.** New roof coverings shall not be installed without first removing all existing layers of roof coverings where any of the following conditions occur:

1. Where the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

Exceptions:

1. Complete and separate roofing systems, such as standing-seam metal roof systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
2. Metal panel, metal shingle, and concrete and clay tile roof coverings shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 6.10.4.

6.10.4 **Roof recovering.** Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other approved materials securely fastened in place.

6.10.5 **Reinstallation of materials.** Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal

counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reinstalled.

6.10.6 **Flashings.** Flashings shall be reconstructed in accordance with approved manufacturer's installation instructions. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

CHAPTER 7
INTERIOR ENVIRONMENT

SECTION 7.1
GENERAL

7.1.1 **Scope.** The provisions of this chapter shall govern ventilation, temperature control, lighting, yards and courts, sound transmission, room dimensions, surrounding materials and rodent proofing associated with the interior spaces of buildings.

SECTION 7.2
DEFINITIONS

7.2.1 **General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

SUNROOM ADDITION. A one-story addition added to an existing building with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

THERMAL ISOLATION. A separation of conditioned spaces, between a sunroom addition and a dwelling unit, consisting of existing or new wall(s), doors and/or windows.

SECTION 7.3
VENTILATION

7.3.1 **General.** Buildings shall be provided with natural ventilation in accordance with Section 7.2.4, or mechanical ventilation in accordance with the SBC 501.

7.3.2 **Attic spaces.** Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof framing members shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain. Blocking and bridging shall be arranged so as not to interfere with the movement of air. A minimum of 25 mm of airspace shall be provided between the insulation and the roof sheathing. The net free ventilating area shall not be less than $^{1}/_{150}$ of the area of the space ventilated, with 50 percent of the required ventilating area provided by ventilators located in the upper portion of the space to be ventilated at least 900 mm above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents.

Exception: The minimum required net free ventilating area shall be $^{1}/_{300}$ of the area of the space ventilated, provided a vapor retarder having a transmission rate not exceeding 1 perm in accordance with ASTM E 96 is installed on the warm side of the attic insulation and provided 50 percent of the required ventilating area provided by ventilators located in the upper portion of the space to be ventilated at least 900 mm above eave or cornice vents, with the balance of the required ventilation provided by eave or cornice vents.

7.3.2.1 **Openings into attic.** Exterior openings into the attic space of any building intended for human occupancy shall be covered with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material that will prevent the entry of birds, squirrels, rodents, snakes and other similar creatures. The openings therein shall be a minimum of 3.2 mm and shall not exceed 6.4 mm. Where

combustion air is obtained from an attic area, it shall be in accordance with SBC 501.

7.3.3 **Under-floor ventilation.** The space between the bottom of the floor joists and the earth under any building except spaces occupied by a basement or cellar shall be provided with ventilation openings through foundation walls or exterior walls. Such openings shall be placed so as to provide cross ventilation of the under-floor space.

7.3.3.1 **Openings for under-floor ventilation.** The minimum net area of ventilation openings shall not be less than 0.67 m^2 for each 100 m^2 of crawl-space area. Ventilation openings shall be covered for their height and width with any of the following materials, provided that the least dimension of the covering shall not exceed 6 mm:

1. Perforated sheet metal plates not less than 1.8 mm thick.
2. Expanded sheet metal plates not less than 1.2 mm thick.
3. Cast-iron grills or gratings.
4. Extruded load-bearing vents.
5. Hardware cloth of 0.89 mm wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension not exceeding 3.2 mm.

7.3.3.2 **Exceptions.** The following are exceptions to Sections 7.3.3 and 7.3.3.1:

1. Where warranted by climatic conditions, ventilation openings to the outdoors are not required if ventilation openings to the interior are provided.
2. The total area of ventilation openings is permitted to be reduced to $^1/_{1,500}$ of the under-floor area where the ground surface is treated with an approved vapor retarder material and the required openings are placed so as to provide cross ventilation of the space. The installation of operable louvers shall not be prohibited.
3. Ventilation openings are not required where continuously operated mechanical ventilation is provided at a rate of 1.02 L/s for each 10 m^2 of crawl-space floor area and the ground surface is covered with an approved vapor retarder.
4. Ventilation openings are not required when the ground surface is covered with an approved vapor retarder, the perimeter walls are insulated and the space is conditioned in accordance with the SBC 501.
5. For buildings in flood hazard areas as established in SBC 301, the openings for under-floor ventilation shall be deemed as meeting the flood opening requirements of ASCE 24 provided that the ventilation openings are designed and installed in accordance with ASCE 24.

7.3.4 **Natural ventilation.** Natural ventilation of an occupied space shall be through windows, doors, louvers or other openings to the outdoors. The operating mechanism for such openings shall be provided with ready access so that the openings are readily controllable by the building occupants.

7.3.4.1 **Ventilation area required.** The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

7.3.4.1.1 **Adjoining spaces.** Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the opening to the adjoining room shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 2.3 m^2. The minimum openable area to the outdoors shall be based on the total floor area being ventilated.

Exception: Exterior openings required for ventilation shall be permitted to open into a thermally isolated sunroom addition or patio cover provided that the openable area between the sunroom addition or patio cover and the interior room

shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 1.8 m^2. The minimum openable area to the outdoors shall be based on the total floor area being ventilated.

7.3.4.1.2 **Openings below grade.** Where openings below grade provide required natural ventilation, the outside horizontal clear space measured perpendicular to the opening shall be one and one-half times the depth of the opening. The depth of the opening shall be measured from the average adjoining ground level to the bottom of the opening.

7.3.4.2 **Contaminants exhausted.** Contaminant sources in naturally ventilated spaces shall be removed in accordance with the SBC 501 and the SBC 801.

7.3.4.2.1 **Bathrooms.** Rooms containing bathtubs, showers, spas and similar bathing fixtures shall be mechanically ventilated in accordance with the SBC 501.

7.3.4.3 **Openings on yards or courts.** Where natural ventilation is to be provided by openings onto yards or courts, such yards or courts shall comply with Section 7.5.

7.3.5 **Other ventilation and exhaust systems.** Ventilation and exhaust systems for occupancies and operations involving flammable or combustible hazards or other contaminant sources as covered in the SBC 501 or the SBC 801 shall be provided as required by both codes.

SECTION 7.4
TEMPERATURE CONTROL

7.4.1 **Equipment and systems.** Interior spaces intended for human occupancy shall be provided with active or passive space-cooling and/or heating systems capable of maintaining a minimum indoor temperature of 20°C at a point 900 mm above the floor on the design heating day.

Exception: Interior spaces where the primary purpose is not associated with human comfort.

SECTION 7.5
LIGHTING

7.5.1 **General.** Every space intended for human occupancy shall be provided with natural light by means of exterior glazed openings in accordance with Section 7.5.2 or shall be provided with artificial light in accordance with Section 7.5.3. Exterior glazed openings shall open directly onto a public way or onto a yard or court in accordance with Section 7.6.

7.5.2 **Natural light.** The minimum net glazed area shall not be less than 8 percent of the floor area of the room served.

7.5.2.1 **Adjoining spaces.** For the purpose of natural lighting, any room is permitted to be considered as a portion of an adjoining room where one-half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room or 2.33 m^2, whichever is greater.

Exception: Openings required for natural light shall be permitted to open into a thermally isolated sunroom addition or patio cover where the common wall provides a glazed area of not less than one-tenth of the floor area of the interior room or 1.8 m^2, whichever is greater.

7.5.2.2 **Exterior openings.** Exterior openings required by Section 7.5.2 for natural light shall open directly onto a public way, yard or court, as set forth in Section 7.6.

Exceptions:

1. Required exterior openings are permitted to open into a roofed porch where the porch:
   1.1 Abuts a public way, yard or court.
   1.2 Has a ceiling height of not less than 2.2 meters.
   1.3 Has a longer side at least 65 percent open and unobstructed.
2. Skylights are not required to open directly onto a public way, yard or court.

7.5.3 **Artificial light.** Artificial light shall be provided that is adequate to provide an average illumination of 107 lux over the area of the room at a height of 750 mm above the floor level.

7.5.4 **Stairway illumination.** Stairways within dwelling units and exterior stairways serving a dwelling unit shall have an illumination level on tread runs of not less than 11 lux. Stairs in other occupancies shall be governed by Chapter 8.

7.5.4.1 **Controls.** The control for activation of the required stairway lighting shall be in accordance with the SBC 401.

7.5.5 **Emergency egress lighting.** The means of egress shall be illuminated in accordance with Section 8.6.1.

SECTION 7.6
YARDS OR COURTS

7.6.1 **General.** This section shall apply to yards and courts adjacent to exterior openings that provide natural light or ventilation. Such yards and courts shall be on the same property as the building.

7.6.2 **Yards.** Yards shall not be less than 900 mm in width for one- and two-story buildings. For buildings more than two stories in height, the minimum width of the yard shall be increased at the rate of 300 mm for each additional story. For buildings exceeding 14 stories in height, the required width of the yard shall be computed on the basis of 14 stories.

7.6.3 **Courts.** Courts shall not be less than 900 mm in width. Courts having windows opening on opposite sides shall not be less than 1.8 meters in width. Courts shall not be less than 3.0 meters in length unless bounded on one end by a public way or yard. For buildings more than two stories in height, the court shall be increased 300 mm in width and 600 mm in length for each additional story. For buildings exceeding 14 stories in height, the required dimensions shall be computed on the basis of 14 stories.

7.6.3.1 **Court access.** Access shall be provided to the bottom of courts for cleaning purposes.

7.6.3.2 **Air intake.** Courts more than two stories in height shall be provided with a horizontal air intake at the bottom not less than 0.9 m^2 in area and leading to the exterior of the building unless abutting a yard or public way.

7.6.3.3 **Court drainage.** The bottom of every court shall be properly graded and drained to a public sewer or other approved disposal system complying with the SBC 701.

SECTION 7.7
SOUND TRANSMISSION

7.7.1 **Scope.** This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent dwelling units or between dwelling units and adjacent public areas such as halls, corridors, stairs or service areas.

7.7.2 **Air-borne sound.** Walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50 (45 if field tested) for air-borne noise when tested in accordance with ASTM E 90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to dwelling unit entrance doors; however, such doors shall be tight fitting to the frame and sill.

7.7.3 **Structure-borne sound.** Floor/ceiling assemblies between dwelling units or between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 50 (45 if field tested) when tested in accordance with ASTM E 492.

SECTION 7.8
INTERIOR SPACE DIMENSIONS

7.8.1 **Minimum room widths.** Habitable spaces, other than a kitchen, shall not be less than 2.2 meters in any plan dimension. Kitchens shall have a clear passageway of not less than 900 mm between counter fronts and appliances or counter fronts and walls.

7.8.2 **Minimum ceiling heights.** Occupiable spaces, habitable spaces and corridors shall have a ceiling height of not less than 2.3 meters. Bathrooms, toilet rooms, kitchens, storage rooms and laundry rooms shall be permitted to have a ceiling height of not less than 2.2 meters.

Exceptions:

1. In one- and two-family dwellings, beams or girders spaced not less than 1.2 meters on center and projecting not more than 150 mm below the required ceiling height.
2. If any room in a building has a sloped ceiling, the prescribed ceiling height for the room is required in one-half the area thereof. Any portion of the room measuring less than 1.5 meters from the finished floor to the ceiling shall not be included in any computation of the minimum area thereof.
3. Mezzanines constructed in accordance with Section 3.5.1.

7.8.2.1 **Furred ceiling.** Any room with a furred ceiling shall be required to have the minimum ceiling height in two-thirds of the area thereof, but in no case shall the height of the furred ceiling be less than 2.2 meters.

7.8.3 **Room area.** Every dwelling unit shall have at least one room that shall have not less than 14 m^2 of net floor area. Other habitable rooms shall have a net floor area of not less than 6.5 m^2.

Exception: Every kitchen in a one- and two-family dwelling shall have not less than 4.6 m^2 of gross floor area.

7.8.4 Efficiency dwelling units. An efficiency living unit shall conform to the requirements of the code except as modified herein:

1. The unit shall have a living room of not less than 20.5 m^2 of floor area. An additional 9.3 m^2 of floor area shall be provided for each occupant of such unit in excess of two.
2. The unit shall be provided with a separate closet.
3. The unit shall be provided with a kitchen sink, cooking appliance and refrigeration facilities, each having a clear working space of not less than 750 mm in front. Light and ventilation conforming to this code shall be provided.
4. The unit shall be provided with a separate bathroom containing a water closet, lavatory and bathtub or shower.

SECTION 7.9
ACCESS TO UNOCCUPIED SPACES

7.9.1 Crawl spaces. Crawl spaces shall be provided with a minimum of one access opening not less than 450 mm by 600 mm.

7.9.2 Attic spaces. An opening not less than 550 mm by 750 mm shall be provided to any attic area having a clear height of over 750 mm. A 750 mm minimum clear headroom in the attic space shall be provided at or above the access opening.

7.9.3 Mechanical appliances. Access to mechanical appliances installed in under-floor areas, in attic spaces and on roofs or elevated structures shall be in accordance with the SBC 501.

SECTION 7.10
SURROUNDING MATERIALS

7.10.1 Floors. In other than dwelling units, toilet and bathing room floors shall have a smooth, hard, nonabsorbent surface that extends upward onto the walls at least 150 mm.

7.10.2 Walls. Walls within 600 mm of urinals and water closets shall have a smooth, hard, nonabsorbent surface, to a height of 1.2 meters above the floor, and except for structural elements, the materials used in such walls shall be of a type that is not adversely affected by moisture.

Exceptions:

1. Dwelling units and sleeping units.
2. Toilet rooms that are not accessible to the public and which have not more than one water closet.

Accessories such as grab bars, towel bars, paper dispensers and soap dishes, provided on or within walls, shall be installed and sealed to protect structural elements from moisture.

7.10.3 Showers. Shower compartments and walls above bathtubs with installed shower heads shall be finished with a smooth, nonabsorbent surface to a height not less than 1.8 meters above the drain inlet.

7.10.4 Waterproof joints. Built-in tubs with showers shall have waterproof joints between the tub and adjacent wall.

7.10.5 **Toilet rooms**. Toilet rooms shall not open directly into a room used for the preparation of food for service to the public.

SECTION 7.11
INTERIOR FINISHES

7.11.1 General

7.11.1.1 **Scope.** Provisions of this Section shall govern the use of materials used as interior finishes, trim and decorative materials.

7.11.1.1.1 **Interior finishes.** These provisions shall limit the allowable flame spread and smoke development based on location and occupancy classification.

Exceptions:

1. Materials having a thickness less than 0.9 mm applied directly to the surface of walls or ceilings.

2. Exposed portions of structural members complying with the requirements for buildings of Type IV construction in Section 6.2.4 shall not be subject to interior finish requirements.

7.11.1.1.2 **Decorative materials and trim.** Decorative materials and trim shall be restricted by combustibility and flame resistance in accordance with Section 7.11.5.

7.11.1.1.3 **Applicability.** For buildings in flood hazard areas as established in SBC 301, interior finishes, trim and decorative materials below the design flood elevation shall be flood-damage-resistant materials.

7.11.1.2 **Application.** Combustible materials shall be permitted to be used as finish for walls, ceilings, floors and other interior surfaces of buildings.

7.11.1.2.1 **Windows.** Show windows in the first story of buildings shall be permitted to be of wood or of unprotected metal framing.

7.11.1.2.2 **Foam plastics.** Foam plastics shall not be used as interior finish or trim except as provided in Section 11.3.7 or 11.4.

7.11.2 Definitions

7.11.2.1 **General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

EXPANDED VINYL WALL COVERING. Wall covering consisting of a woven textile backing, an expanded vinyl base coat layer and a nonexpanded vinyl skin coat. The expanded base coat layer is a homogeneous vinyl layer that contains a blowing agent. During processing, the blowing agent decomposes, causing this layer to expand by forming closed cells. The total thickness of the wall covering is approximately 1.4 mm to 1.78 mm.

FLAME RESISTANCE. That property of materials or combinations of component materials that restricts the spread of flame in accordance with NFPA 701.

FLAME SPREAD. The propagation of flame over a surface.

FLAME SPREAD INDEX. The numerical value assigned to a material tested in accordance with ASTM E 84.

INTERIOR FINISH. Interior finish includes interior wall and ceiling finish and interior floor finish.

INTERIOR FLOOR FINISH. The exposed floor surfaces of buildings including coverings applied over a finished floor or stair, including risers.

INTERIOR WALL AND CEILING FINISH. The exposed interior surfaces of buildings including, but not limited to: fixed or movable walls and partitions; columns; ceilings; and interior wainscotting, paneling or other finish applied structurally or for decoration, acoustical correction, surface insulation, structural fire resistance or similar purposes, but not including trim.

SMOKE-DEVELOPED INDEX. The numerical value assigned to a material tested in accordance with ASTM E 84.

TRIM. Picture molds, chair rails, baseboards, handrails, door and window frames and similar decorative or protective materials used in fixed applications.

7.11.3 WALL AND CEILING FINISHES

7.11.3.1 General. Interior wall and ceiling finishes shall be classified in accordance with ASTM E 84. Such interior finish materials shall be grouped in the following classes in accordance with their flame spread and smoke-developed indexes.

Class A: Flame spread 0-25; smoke-developed 0-450.

Class B: Flame spread 26-75; smoke-developed 0-450.

Class C: Flame spread 76-200; smoke-developed 0-450.

Exception: Materials, other than textiles, tested in accordance with Section 7.11.3.2.

7.11.3.2 Interior wall or ceiling finishes other than textiles. Interior wall or ceiling finishes, other than textiles, shall be permitted to be tested in accordance with NFPA 286. Finishes tested in accordance with NFPA 286 shall comply with Section 7.11.3.2.1.

7.11.3.2.1 Acceptance criteria. During the 40 kW exposure, the interior finish shall comply with Item 1. During the 160 kW exposure, the interior finish shall comply with Item 2.

During the entire test, the interior finish shall comply with Item 3.

1. During the 40kW exposure, flames shall not spread to the ceiling.
2. During the 160 kW exposure, the interior finish shall comply with the following:
   - 2.1 Flame shall not spread to the outer extremity of the sample on any wall or ceiling.
   - 2.2 Flashover, as defined in NFPA 286, shall not occur.
3. The total smoke released throughout the NFPA 286 test shall not exceed 1,000 m^2.

CHAPTER 8
MEANS OF EGRESS

SECTION 8.1
ADMINISTRATION

8.1.1 **General.** Buildings or portions thereof shall be provided with a means of egress system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of means of egress components required to provide an approved means of egress from structures and portions thereof.

8.1.2 **Minimum requirements.** It shall be unlawful to alter a building or structure in a manner that will reduce the number of exits or the capacity of the means of egress to less than required by these code requirements.

8.1.3 **Maintenance.** Means of egress shall be maintained in accordance with the SBC 801.

SECTION 8.2
DEFINITIONS

8.2.1 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the meanings shown herein.

ACCESSIBLE MEANS OF EGRESS. A continuous and unobstructed way of egress travel from any point in a building or facility that provides an accessible route to an area of refuge, a horizontal exit or a public way.

AISLE ACCESSWAY. That portion of an exit access that leads to an aisle.

ALTERNATING TREAD DEVICE. A device that has a series of steps between 50 and 70 degrees from horizontal, usually attached to a center support rail in an alternating manner so that the user does not have both feet on the same level at the same time.

AREA OF REFUGE. An area where persons unable to use stairways can remain temporarily to await instructions or assistance during emergency evacuation.

BLEACHERS. Tiered seating facilities.

COMMON PATH OF EGRESS TRAVEL. That portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available. Paths that merge are common paths of travel. Common paths of egress travel shall be included within the permitted travel distance.

CORRIDOR. An enclosed exit access component that defines and provides a path of egress travel to an exit.

DOOR, BALANCED. A door equipped with double-pivoted hardware so designed as to cause a semi counterbalanced swing action when opening.

EGRESS COURT. A court or yard which provides access to a public way for one

or more exits.

EMERGENCY ESCAPE AND RESCUE OPENING. An operable window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency.

EXIT. That portion of a means of egress system which is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives as required to provide a protected path of egress travel between the exit access and the exit discharge. Exits include exterior exit doors at ground level, exit enclosures, exit passageways, exterior exit stairs, exterior exit ramps and horizontal exits.

EXIT, HORIZONTAL. A path of egress travel from one building to an area in another building on approximately the same level, or a path of egress travel through or around a wall or partition to an area on approximately the same level in the same building, which affords safety from fire and smoke from the area of incidence and areas communicating therewith.

EXIT ACCESS. That portion of a means of egress system that leads from any occupied portion of a building or structure to an exit.

EXIT DISCHARGE. That portion of a means of egress system between the termination of an exit and a public way.

EXIT DISCHARGE, LEVEL OF. The horizontal plane located at the point at which an exit terminates and an exit discharge begins.

EXIT ENCLOSURE. An exit component that is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a vertical or horizontal direction to the exit discharge or the public way.

EXIT PASSAGEWAY. An exit component that is separated from all other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a horizontal direction to the exit discharge or the public way.

FIRE EXIT HARDWARE. Panic hardware that is listed for use on fire door assemblies.

FLOOR AREA, GROSS. The floor area within the inside perimeter of the exterior walls of the building under consideration, exclusive of vent shafts and courts, without deduction for corridors, stairways, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof, not provided with surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area shall not include shafts with no openings or interior courts.

FLOOR AREA, NET. The actual occupied area not including unoccupied accessory areas such as corridors, stairways, toilet rooms, mechanical rooms and closets.

FOLDING AND TELESCOPIC SEATING. Tiered seating facilities having an overall shape and size that are capable of being reduced for purposes of moving or storing.

GRANDSTAND. Tiered seating facilities.

GUARD. A building component or a system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

HANDRAIL. A horizontal or sloping rail intended for grasping by the hand for guidance or support.

MEANS OF EGRESS. A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit and the exit discharge.

NOSING. The leading edge of treads of stairs and of landings at the top of stairway flights.

OCCUPANT LOAD. The number of persons for which the means of egress of a building or portion thereof is designed.

PANIC HARDWARE. A door-latching assembly incorporating a device that releases the latch upon the application of a force in the direction of egress travel.

PUBLIC WAY. A street, alley or other parcel of land open to the outside air leading to a street, that has been deeded, dedicated or otherwise permanently appropriated to the public for public use and which has a clear width and height of not less than 3.0 meters.

RAMP. A walking surface that has a running slope steeper than one unit vertical in 20 units horizontal (5 percent slope).

SCISSOR STAIR. Two interlocking stairways providing two separate paths of egress located within one stairwell enclosure.

SMOKE-PROTECTED ASSEMBLY SEATING. Seating served by means of egress that is not subject to smoke accumulation within or under a structure.

STAIR. A change in elevation, consisting of one or more risers.

STAIRWAY. One or more flights of stairs, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another.

STAIRWAY, EXTERIOR. A stairway that is open on at least one side, except for required structural columns, beams, handrails and guards. The adjoining open areas shall be either yards, courts or public ways. The other sides of the exterior stairway need not be open.

STAIRWAY, INTERIOR. A stairway not meeting the definition of an exterior stairway.

STAIRWAY, SPIRAL. A stairway having a closed circular form in its plan view with uniform section-shaped treads attached to and radiating from a minimum-diameter supporting column.

WINDER. A tread with nonparallel edges.

SECTION 8.3
GENERAL MEANS OF EGRESS

8.3.1 **Applicability.** The general requirements specified in Sections 8.3 through 8.12 shall apply to all three elements of the means of egress system, in addition to those specific requirements for the exit access, the exit and the exit discharge detailed elsewhere in this chapter.

8.3.2 **Ceiling height.** The means of egress shall have a ceiling height of not less than 2 meters.

Exceptions:

1. Sloped ceilings in accordance with Section 7.8.2.
2. Ceilings of dwelling units and sleeping units within residential occupancies in accordance with Section 7.8.2.
3. Allowable projections in accordance with Section 8.3.3.
4. Stair headroom in accordance with Section 8.9.2.
5. Door height in accordance with Section 8.8.1.1.

8.3.3 **Protruding objects.** Protruding objects shall comply with the requirements of Sections 8.3.3.1 through 8.3.3.4.

8.3.3.1 **Headroom.** Protruding objects are permitted to extend below the minimum ceiling height required by Section 8.3.2 provided a minimum headroom of 2.1 meters shall be provided for any walking surface, including walks, corridors, aisles and passageways. Not more than 50 percent slope of the ceiling area of a means of egress shall be reduced in height by protruding objects.

Exception: Door closers and stops shall not reduce headroom to less than 2.0 meters. A barrier shall be provided where the vertical clearance is less than 2.1 meters high. The leading edge of such a barrier shall be located 685 mm maximum above the floor.

8.3.3.2 **Free-standing objects.** A free-standing object mounted on a post or pylon shall not overhang that post or pylon more than 300 mm where the lowest point of the leading edge is more than 685 mm and less than 2.1 meters above the walking surface. Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 300 mm, the lowest edge of such sign or obstruction shall be 685 mm maximum or 2.1 meters minimum above the finish floor or ground.

Exception: This requirement shall not apply to sloping portions of handrails serving stairs and ramps.

8.3.3.3 **Horizontal projections.** Structural elements, fixtures or furnishings shall not project horizontally from either side more than 100 mm over any walking surface between the heights of 685 mm and 2.1 meters above the walking surface.

Exception: Handrails serving stairs and ramps are permitted to protrude 115 mm

from the wall.

8.3.3.4 **Clear width.** Protruding objects shall not reduce the minimum clear width of accessible routes as required in Section 9.4.

8.3.4 **Floor surface.** Walking surfaces of the means of egress shall have a slip-resistant surface and be securely attached.

8.3.5 **Elevation change.** Where changes in elevation of less than 300 mm exist in the means of egress, sloped surfaces shall be used. Where the slope is greater than one unit vertical in 20 units horizontal (5 percent slope), ramps complying with Section 8.10 shall be used. Where the difference in elevation is 150 mm or less, the ramp shall be equipped with either handrails or floor finish materials that contrast with adjacent floor finish materials.

Exceptions:

1. A single step with a maximum riser height of 180 mm is permitted for buildings with occupancies in Groups F, H, R-2 and R-3 as applicable in SBC 100 and Groups S and U at exterior doors not required to be accessible by Chapter 9.

2. A stair with a single riser or with two risers and a treads permitted at locations not required to be accessible by Chapter 9, provided that the risers and treads comply with Section 8.9.3, the minimum depth of the tread is 330 mm and at least one handrail complying with Section 8.9.11 is provided within 760 mm of the centerline of the normal path of egress travel on the stair.

3. An aisle serving seating that has a difference in elevation less than 300 mm is permitted at locations not required to be accessible by Chapter 9, provided that the risers and treads comply with Section 8.24.11 and the aisle is provided with a handrail or sloped walkway.

8.3.6 **Means of egress continuity.** The path of egress travel along a means of egress shall not be interrupted by any building element other than a means of egress component as specified in this chapter. Obstructions shall not be placed in the required width of a means of egress except projections permitted by this chapter. The required capacity of a means of egress system shall not be diminished along the path of egress travel.

8.3.7 **Elevators, escalators and moving walks.** Elevators, escalators and moving walks shall not be used as a component of a required means of egress from any other part of the building.

Exception: Elevators used as an accessible means of egress in accordance with Section 8.7.4.

SECTION 8.4
OCCUPANT LOAD

8.4.1 **Design occupant load.** In determining means of egress requirements, the number of occupants for whom means of egress facilities shall be provided shall be established by the largest number computed in accordance with Sections 8.4.1.1 through 8.4.1.3.

8.4.1.1 **Actual number.** The actual number of occupants for whom each occupied space, floor or building is designed.

8.4.1.2 **Number by Table 8.4.1.2.** The number of occupants computed at the rate of one occupant per unit of area as prescribed in Table 8.4.1.2.

8.4.1.3 **Number by combination.** Where occupants from accessory spaces egress through a primary area, the calculated occupant load for the primary space shall include the total occupant load of the primary space plus the number of occupants egressing through it from the accessory space.

8.4.2 **Increased occupant load.** The occupant load permitted in any building or portion thereof is permitted to be increased from that number established for the occupancies in Table 8.4.1.2 provided that all other requirements of the code are also met based on such modified number and the occupant load shall not exceed one occupant per 0.47 m^2 of occupiable floor space. Where required by the building official, an approved aisle, seating or fixed equipment diagram substantiating any increase in occupant load shall be submitted. Where required by the building official, such diagram shall be posted.

8.4.3 **Posting of occupant load.** Every room or space that is an assembly occupancy shall have the occupant load of the room or space posted in a conspicuous place, near the main exit or exit access doorway from the room or space. Posted signs shall be of an approved legible permanent design and shall be maintained by the owner or authorized agent.

8.4.4 **Exiting from multiple levels.** Where exits serve more than one floor, only the occupant load of each floor considered individually shall be used in computing the required capacity of the exits at that floor, provided that the exit capacity shall not decrease in the direction of egress travel.

8.4.5 **Egress convergence.** Where means of egress from floors above and below converge at an intermediate level, the capacity of the means of egress from the point of convergence shall not be less than the sum of the two floors.

8.4.6 **Mezzanine levels.** The occupant load of a mezzanine level with egress onto a room or area below shall be added to that room or area's occupant load, and the capacity of the exits shall be designed for the total occupant load thus established.

8.4.7 **Fixed seating.** For areas having fixed seats and aisles, the occupant load shall be determined by the number of fixed seats installed therein.

For areas having fixed seating without dividing arms, the occupant load shall not be less than the number of seats based on one person for each 450 mm of seating length.

TABLE 8.4.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

OCCUPANCY	FLOOR AREA IN m^2 PER OCCUPANT
Agricultural building	28 gross
Aircraft hangars	46.5 gross
Airport terminal Baggage claim Baggage handling Concourse Waiting areas	 1.85 gross 28 gross 9.3 gross 1.4 gross
Assembly Gaming floors (keno, slots, etc.)	 1 gross
Assembly with fixed seats	See Section 8.3.2.2.9
Assembly without fixed seats Concentrated (chairs only not fixed) Standing space Unconcentrated (tables and chairs)	 0.65 net 0.47 net 1.4 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	0.65 net
Business areas	9.3 gross
Courtrooms—other than fixed seating areas	3.7 net
Dormitories	4.6 gross
Educational Classroom area Shops and other vocational room areas	 1.85 net 4.6 net
Exercise rooms	4.6 gross
H-5 Fabrication and manufacturing areas	18.6 gross
Industrial areas	9.3 gross
Institutional areas Inpatient treatment areas Outpatient areas Sleeping areas	 22.3 gross 9.3 gross 11.1 gross
Kitchens, commercial	18.6 gross
Library Reading rooms Stack area	 4.6 net 9.3 gross
Locker rooms	4.6 gross
Mercantile Areas on other floors Basement and grade floor areas Storage, stock, shipping areas	 5.6 gross 2.8 gross 28 gross
Parking garages	18.6 gross
Residential	18.6 gross
Skating rinks, swimming pools Rink and pool Decks	 4.6 gross 1.4 gross
Stages and platforms	1.4 net
Accessory storage areas, mechanical equipment room	28 gross
Warehouses	46.5 gross

The occupant load of seating booths shall be based on one person for each 600 mm of booth seat length measured at the backrest of the seating booth.

8.4.8 **Outdoor areas.** Yards, patios, courts and similar outdoor areas accessible to and usable by the building occupants shall be provided with means of egress as required by this chapter. The occupant load of such outdoor areas shall be assigned by the building official in accordance with the anticipated use. Where outdoor areas are to be used by persons in addition to the occupants of the building, and the path of egress travel from the outdoor areas passes through the building, means of egress requirements for the building shall be based on the sum of the occupant loads of the building plus the outdoor areas.

Exceptions:

1. Outdoor areas used exclusively for service of the building need only have one means of egress.
2. Both outdoor areas associated with Group R-3 and individual dwelling units of Group R-2, as applicable in SBC 100.

8.4.9 **Multiple occupancies.** Where a building contains two or more occupancies, the means of egress requirements shall apply to each portion of the building based on the occupancy of that space. Where two or more occupancies utilize portions of the same means of egress system, those egress components shall meet the more stringent requirements of all occupancies that are served.

SECTION 8.5
EGRESS WIDTH

8.5.1 **Minimum required egress width.** The means of egress width shall not be less than required by this section. The total width of means of egress in mm shall not be less than the total occupant load served by the means of egress multiplied by the factors in Table 8.5.1 and not less than specified elsewhere in this code requirements. Multiple means of egress shall be sized such that the loss of any one means of egress shall not reduce the available capacity to less than 50 percent slope of the required capacity. The maximum capacity required from any story of a building shall be maintained to the termination of the means of egress.

Exception: Means of egress complying with Section 8.24.

TABLE 8.5.1
EGRESS WIDTH PER OCCUPANT SERVED

OCCUPANCY	WITHOUT SPRINKLER SYSTEM		WITH SPRINKLER SYSTEM[a]	
	Stairways (mm per occupant)	Other egress components (mm per occupant)	Stairways (mm per occupant)	Other egress components (mm per occupant)
Occupancies other than those listed below	7.6	5	5	3.8
Hazardous: H-1, H-2, H-3 and H-4	17.8	10.2	7.6	5
Institutional: I-2	NA	NA	7.6	5

a Buildings equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801.

8.5.2 **Door encroachment.** Doors opening into the path of egress travel shall not reduce the required width to less than one-half during the course of the swing. When fully open, the door shall not project more than 180 mm into the required width.

Exception: The restrictions on a door swing shall not apply to doors within individual dwelling units and sleeping units of Group R-2 and dwelling units of Group R-3.

SECTION 8.6
MEANS OF EGRESS ILLUMINATION

8.6.1 **Illumination required.** The means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied.

Exceptions:

1. Occupancies in Group U.
2. Aisle access ways in Group A.
3. Dwelling units and sleeping units in Groups R-1, R-2 and R-3.
4. Sleeping units of Group I occupancies.

8.6.2 **Illumination level.** The means of egress illumination level shall not be less than 11 lux at the floor level.

Exception: For auditoriums, theaters, concert or opera halls and similar assembly occupancies, the illumination at the floor level is permitted to be reduced during performances to not less than 2.15 lux provided that the required illumination is automatically restored upon activation of a premise's fire alarm system where such system is provided.

8.6.3 **Illumination emergency power.** The power supply for means of egress illumination shall normally be provided by the premise's electrical supply.

1. In the event of power supply failure, an emergency electrical system shall automatically illuminate the following areas:
2. Exit access corridors, passageways and aisles in rooms and spaces which require two or more means of egress.
3. Exit access corridors and exit stairways located in buildings required to have two or more exits.
4. Exterior egress components at other than the level of exit discharge until exit discharge is accomplished for buildings required to have two or more exits.
5. Interior exit discharge elements, as permitted in Section 8.23.1, in buildings required to have two or more exits.
6. The portion of the exterior exit discharge immediately adjacent to exit discharge doorways in buildings required to have two or more exits.

The emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with SBC 401 and Section 5D.4 of the SBC 801.

8.6.4 **Performance of system.** Emergency lighting facilities shall be arranged to provide initial illumination that is at least an average of 11 lux and a minimum at any point of 1 lux measured along the path of egress at floor level. Illumination levels shall be permitted to decline to 6 lux average and a minimum at any point of 0.6 lux at the end of the emergency lighting time duration. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

SECTION 8.7
ACCESSIBLE MEANS OF EGRESS

8.7.1 **Accessible means of egress required.** Accessible means of egress shall comply with this section. Accessible spaces shall be provided with not less than one accessible means of egress. Where more than one means of egress is required by Section 8.14.1 or 8.18.1 from any accessible space, each accessible portion of the space shall be served by not less than two accessible means of egress.

Exceptions:

1. Accessible means of egress are not required in alterations to existing buildings.

2. One accessible means of egress is required from an accessible mezzanine level in accordance with Section 8.7.3 or 8.7.4.

3. In assembly spaces with sloped floors, one accessible means of egress is required from a space where the common path of travel of the accessible route for access to the wheelchair spaces meets the requirements in Section 8.24.9.

8.7.2 **Continuity and components.** Each required accessible means of egress shall be continuous to a public way and shall consist of one or more of the following components:

1. Accessible routes complying with Section 9.4.

2. Stairways within exit enclosures complying with Sections 8.7.3 and 8.19.1.

3. Elevators complying with Section 8.7.4.

4. Platform lifts complying with Section 8.7.5.

5. Horizontal exits.

6. Smoke barriers.

Exceptions:

1. Where the exit discharge is not accessible, an exterior area for assisted rescue must be provided in accordance with Section 8.7.8.

2. Where the exit stairway is open to the exterior, the accessible means of egress shall include either an area of refuge in accordance with Section 8.7.6 or an exterior area for assisted rescue in accordance with Section 8.7.8.

8.7.2.1 **Buildings with four or more stories.** In buildings where a required accessible floor is four or more stories above or below a level of exit discharge, at least one required accessible means of egress shall be an elevator complying with Section 8.7.4.

Exceptions:

1. In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801 the elevator shall not be required on floors provided with a horizontal exit and located at or above the level of exit discharge.

2. In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801, the elevator shall not be required on floors provided with a ramp conforming to the provisions of Section 8.10.

8.7.3 **Enclosed exit stairways.** An enclosed exit stairway, to be considered part of an accessible means of egress, shall have a clear width of 1.2 meters minimum between handrails and shall either incorporate an area of refuge within an enlarged floor-level landing or shall be accessed from either an area of refuge complying with Section 8.7.6 or a horizontal exit.

Exceptions:

1. Open exit stairways as permitted by Section 8.19.1 are permitted to be considered part of an accessible means of egress.
2. The area of refuge is not required at open stairways that are permitted by Section 8.19.1 in buildings or facilities that are equipped throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801.
3. The clear width of 1.2 meters between handrails and the area of refuge is not required at exit stairways in buildings or facilities equipped throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801.
4. The clear width of 1.2 meters between handrails is not required for enclosed exit stairways accessed from a horizontal exit.
5. Areas of refuge are not required at exit stairways serving open parking garages.

8.7.4 **Elevators.** An elevator to be considered part of an accessible means of egress shall comply with the emergency operation and signaling device requirements of Section 2.27 of ASME A17.1. Standby power shall be provided in accordance with SBC 401 and 501. The elevator shall be accessed from either an area of refuge complying with Section 8.7.6 or a horizontal exit.

Exceptions:

1. Elevators are not required to be accessed from an area of refuge or horizontal exit in open parking garages.
2. Elevators are not required to be accessed from an area of refuge or horizontal exit in buildings and facilities equipped throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801.

8.7.5 **Platform lifts.** Platform (wheelchair) lifts shall not serve as part of an accessible means of egress, except where allowed as part of a required accessible route in Section 9.9.7. Platform lifts in accordance with SBC 401 shall be installed in accordance with ASME A18.1. Standby power shall be provided for platform lifts permitted to serve as part of a means of egress.

8.7.6 **Areas of refuge.** Every required area of refuge shall be accessible from the space it serves by an accessible means of egress. The maximum travel distance from any accessible space to an area of refuge shall not exceed the travel distance permitted for the occupancy in accordance with Section 8.5.1. Every required area of refuge shall have direct access to an enclosed stairway complying with Sections 8.7.3 and 8.19.1 or an elevator complying with Section 8.7.4. Where an elevator lobby is used as an area of refuge, the shaft and lobby shall comply with Section 8.19.1.8 for smokeproof enclosures except where the elevators are in an area of refuge formed by a horizontal exit or smoke barrier.

8.7.6.1 **Size.** Each area of refuge shall be sized to accommodate one wheelchair space of 760 mm by 1200 mm for each 200 occupants or portion thereof, based on the occupant load of the area of refuge and areas served by the area of refuge. Such wheelchair spaces shall not reduce the required means of egress width. Access to any of the required wheelchair spaces in an area of refuge shall not be obstructed by more than one adjoining wheelchair space.

8.7.6.2 **Separation.** Each area of refuge shall be separated from the remainder of the story by a smoke barrier complying with Section 4.10 of SBC 801. Each area of refuge shall be designed to minimize the intrusion of smoke.

Exceptions:

1. Areas of refuge located within a stairway enclosure.
2. Areas of refuge where the area of refuge and areas served by the area of refuge are equipped throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801.

8.7.6.3 **Two-way communication.** Areas of refuge shall be provided with a two-way communication system between the area of refuge and a central control point. If the central control point is not constantly attended, the area of refuge shall also have controlled access to a public telephone system. Location of the central control point shall be approved by the fire department. The two-way communication system shall include both audible and visible signals.

8.7.6.4 **Instructions.** In areas of refuge that have a two-way emergency communications system, instructions on the use of the area under emergency conditions shall be posted adjoining the communications system. The instructions shall include all of the following:

1. Directions to find other means of egress.
2. Persons able to use the exit stairway do so as soon as possible, unless they are assisting others.
3. Information on planned availability of assistance in the use of stairs or supervised operation of elevators and how to summon such assistance.
4. Directions for use of the emergency communications system.

8.7.6.5 **Identification.** Each door providing access to an area of refuge from an adjacent floor area shall be identified by a bilingual sign *(Arabic and English)* complying with ICC A117.1, stating: AREA OF REFUGE, and including the International Symbol of Accessibility. Where exit sign illumination is required by Section 8.11.2, the area of refuge sign shall be illuminated. Additionally, tactile signage complying with ICC A117.1 shall be located at each door to an area of refuge.

8.7.7 **Signage.** At exits and elevators serving a required accessible space but not providing an approved accessible means of egress, signage shall be installed indicating the location of accessible means of egress.

8.7.8 **Exterior area for assisted rescue.** The exterior area for assisted rescue must be open to the outside air and meet the requirements of Section 8.7.6.1. Separation walls shall comply with the requirements of Section 4.5 of SBC 801 for exterior walls. Where walls or openings are between the area for assisted rescue and the interior of the building, the building exterior walls within 3.0 meters horizontally of a nonrated wall or unprotected opening shall be constructed as required for a minimum 1 hour fire-resistance rating with 3/4-hour opening protectives. This construction shall extend vertically from the ground to a point 3.0 meters above the floor level of the area for assisted rescue or to the roof line, whichever is lower.

8.7.8.1 **Openness.** The exterior area for assisted rescue shall be at least 50 percent slope open, and the open area above the guards shall be so distributed as to minimize the accumulation of smoke or toxic gases.

8.7.8.2 **Exterior exit stairway.** Exterior exit stairways that are part of the means of egress for the exterior area for assisted rescue shall provide a clear width of 1.2 meters between handrails.

8.7.8.3 **Identification.** Exterior areas for assisted rescue shall have identification as required for area of refuge that complies with Section 8.7.6.5.

SECTION 8.8
DOORS, GATES AND TURNSTILES

8.8.1 **Doors.** Means of egress doors shall meet the requirements of this section. Doors serving a means of egress system shall meet the requirements of this section and Section 8.17.2. Doors provided for egress purposes in numbers greater than required by this code requirements shall meet the requirements of this section.

Means of egress doors shall be readily distinguishable from the adjacent construction and finishes such that the doors are easily recognizable as doors. Mirrors or similar reflecting materials shall not be used on means of egress doors. Means of egress doors shall not be concealed by curtains, drapes, decorations or similar materials.

8.8.1.1 **Size of doors.** The minimum width of each door opening shall be sufficient for the occupant load thereof and shall provide a clear width of not less than 810 mm Clear openings of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees. Where this section requires a minimum clear width of 810 mm and a door opening includes two door leaves without a mullion, one leaf shall provide a clear opening width of 810 mm. The maximum width of a swinging door leaf shall be 1.2 meters nominal. Means of egress doors in an occupancy in Group I-2 used for the movement of beds shall provide a clear width not less than 1.0 meters. The height of doors shall not be less than 2.1 meters.

Exceptions:

1. The minimum and maximum width shall not apply to door openings that are not part of the required means of egress in occupancies in Groups R-2 and R-3 as applicable in SBC 100.
2. Door openings to resident sleeping units in occupancies in Group I-3 shall have a clear width of not less than 710 mm.
3. Door openings to storage closets less than 0.9 m^2 in area shall not be limited by the minimum width.
4. Width of door leafs in revolving doors that comply with Section 8.8.1.3.1 shall not be limited.
5. Door openings within a dwelling unit or sleeping unit shall not be less than 2.0 meters in height.
6. Exterior door openings in dwelling units and sleeping units, other than the required exit door, shall not be less than 2.0 meters in height.
7. Interior egress doors within a dwelling unit or sleeping unit which is not required to be adaptable or accessible.
8. Door openings required to be accessible within Type B dwelling units shall have a minimum clear width of 800 mm.

8.8.1.1.1 **Projections into clear width.** There shall not be projections into the required clear width lower than 860 mm above the floor or ground. Projections into the clear opening width between 860 mm and 2.1 m above the floor or ground shall not exceed 100 mm.

8.8.1.2 **Door swing.** Egress doors shall be side-hinged swinging.

Exceptions:

1. Private garages, office areas, factory and storage areas with an occupant load of 10 or less.
2. Group I-3 occupancies used as a place of detention.
3. Doors within or serving a single dwelling unit in Groups R-2 and R-3 as applicable in Chapter 2.
4. In other than Group H occupancies, revolving doors complying with Section

8.8.1.3.1.

5. In other than Group H occupancies, horizontal sliding doors complying with Section 8.8.1.3.3 are permitted in a means of egress.

6. Power-operated doors in accordance with Section 8.8.1.3.1.

Doors shall swing in the direction of egress travel where serving an occupant load of 50 or more persons or a Group H occupancy.

The opening force for interior side-swinging doors without closers shall not exceed a 22 N force. For other side-swinging, sliding and folding doors, the door latch shall release when subjected to a 67 N force. The door shall be set in motion when subjected to a 133 N force. The door shall swing to a full-open position when subjected to a 67 N force. Forces shall be applied to the latch side.

8.8.1.3 **Special doors.** Special doors and security grilles shall comply with the requirements of Sections 8.8.1.3.1 through 8.8.1.3.5.

8.8.1.3.1 **Revolving doors.** Revolving doors shall comply with the following:

Each revolving door shall be capable of collapsing into a bookfold position with parallel egress paths providing an aggregate width of 900 mm.

A revolving door shall not be located within 3.1 meters of the foot of or top of stairs or escalators. A dispersal area shall be provided between the stairs or escalators and the revolving doors.

The revolutions per minute (rpm) for a revolving door shall not exceed those shown in Table 8.8.1.3.1.

Each revolving door shall have a side-hinged swinging doo which complies with Section 8.8.1 in the same wall and within 3.1 meters of the revolving door.

TABLE 8.8.1.3.1
REVOLVING DOOR SPEEDS

INSIDE DIAMETER mm	POWER-DRIVEN-TYPE SPEED CONTROL (rpm)	MANUAL-TYPE SPEED CONTROL (rpm)
1980	11	12
2130)	10	11
2290)	9	11
2440)	9	10
2590	8	9
2740	8	9
2900	7	8
3050	7	8

8.8.1.3.1.1 **Egress component.** A revolving door used as a component of a means of egress shall comply with Section 8.8.1.3.1 and the following three conditions:

1. Revolving doors shall not be given credit for more than 50 percent slope of the required egress capacity.

2. Each revolving door shall be credited with no more than a 50-person capacity.

3. Each revolving door shall be capable of being collapsed when a force of not more than 578 N is applied within 75 mm of the outer edge of a wing.

8.8.1.3.1.2 **Other than egress component.** A revolving door used as other than a component of a means of egress shall comply with Section 8.8.1.3.1. The collapsing force of a revolving door not used as a component of a means of egress shall not be more than 801 N.

Exception: A collapsing force in excess of 801 N is permitted if the collapsing force is reduced to not more than 578 N when at least one of the following conditions is satisfied:

1. There is a power failure or power is removed to the device holding the door wings in position.
2. There is an actuation of the automatic sprinkler system where such system is provided.
3. There is an actuation of a smoke detection system which is installed in accordance with Section 7.7 of SBC 801 to provide coverage in areas within the building which are within 23.0 meters of the revolving doors.
4. There is an actuation of a manual control switch, in an approved location and clearly defined, which reduces the holding force to below the 578 N force level.

8.8.1.3.2 **Power-operated doors.** Where means of egress doors are operated by power, such as doors with a photoelectric-actuated mechanism to open the door upon the approach of a person, or doors with power-assisted manual operation, the design shall be such that in the event of power failure, the door is capable of being opened manually to permit means of egress travel or closed where necessary to safeguard means of egress. The forces required to open these doors manually shall not exceed those specified in Section 8.8.1.2, except that the force to set the door in motion shall not exceed 220 N. The door shall be capable of swinging from any position to the full width of the opening in which such door is installed when a force is applied to the door on the side from which egress is made. Full-power-operated doors shall comply with BHMA A156.10. Power-assisted and low-energy doors shall comply with BHMA A156.19.

Exceptions:
1. Occupancies in Group I-3.
2. Horizontal sliding doors complying with Section 8.8.1.3.3.
3. For a biparting door in the emergency breakout mode, a door leaf located within a multiple-leaf opening shall be exempt from the minimum 810 mm single-leaf requirement of Section 8.8.1.1, provided a minimum 810 mm clear opening is provided when the two biparting leaves meeting in the center are broken out.

8.8.1.3.3 **Horizontal sliding doors.** In other than Group H occupancies, horizontal sliding doors permitted to be a component of a means of egress in accordance with Exception 5 to Section 8.8.1.2 shall comply with all of the following criteria:
1. The doors shall be power operated and shall be capable of being operated manually in the event of power failure.
2. The doors shall be openable by a simple method from both sides without special knowledge or effort.
3. The force required to operate the door shall not exceed 133 N to set the door in motion and 67 N to close the door or open it to the minimum required width.
4. The door shall be openable with a force not to exceed 67 N when a force of 1100 N is applied perpendicular to the door adjacent to the operating device.
5. The door assembly shall comply with the applicable fire protection rating and, where rated, shall be self-closing or automatic-closing by smoke detection, shall be installed in accordance with NFPA 80 and shall comply with Section 4B.15 of SBC 801.
6. The door assembly shall have an integrated standby power supply.
7. The door assembly power supply shall be electrically supervised.
8. The door shall open to the minimum required width within 10 seconds after activation of the operating device.

8.8.1.3.4 **Access-controlled egress doors.** The entrance doors in a means of egress in buildings with an occupancy in Group A, B, E, M, R-1 or R-2 and entrance doors

to tenant spaces in occupancies in Groups A, B, E, M, R-1 and R-2 are permitted to be equipped with an approved entrance and egress access control system which shall be installed in accordance with all of the following criteria:

1. A sensor shall be provided on the egress side arranged to detect an occupant approaching the doors. The doors shall be arranged to unlock by a signal from or loss of power to the sensor.
2. Loss of power to that part of the access control system which locks the doors shall automatically unlock the doors.
3. The doors shall be arranged to unlock from a manual unlocking device located 1.0 meters to 1.2 meters vertically above the floor and within 1.5 meters of the secured doors. Ready access shall be provided to the manual unlocking device and the device shall be clearly identified by a bilingual sign *(Arabic and English)* that reads "PUSH TO EXIT" When operated, the manual unlocking device shall result in direct interruption of power to the lock—independent of the access control system electronics—and the doors shall remain unlocked for a minimum of 30 seconds.
4. Activation of the building fire alarm system, if provided, shall automatically unlock the doors, and the doors shall remain unlocked until the fire alarm system has been reset.
5. Activation of the building automatic sprinkler or fire detection system, if provided, shall automatically unlock the doors. The doors shall remain unlocked until the fire alarm system has been reset.
6. Entrance doors in buildings with an occupancy in Group A, B, E or M shall not be secured from the egress side during periods that the building is open to the general public.

8.8.1.3.5 **Security grilles.** In Groups B, F, M and S, horizontal sliding or vertical security grilles are permitted at the main exit and shall be openable from the inside without the use of a key or special knowledge or effort during periods that the space is occupied. The grilles shall remain secured in the full-open position during the period of occupancy by the general public. Where two or more means of egress are required, not more than one-half of the exits or exit access doorways shall be equipped with horizontal sliding or vertical security grilles.

8.8.1.4 **Floor elevation.** There shall be a floor or landing on each side of a door. Such floor or landing shall be at the same elevation on each side of the door. Landings shall be level except for exterior landings, which are permitted to have a slope not to exceed 0.25 unit vertical in 12 units horizontal (2 percent slope).

Exceptions:

1. Doors serving individual dwelling units in Groups R-2 and R-3 as applicable in SBC 100 where the following apply:
   1.1 A door is permitted to open at the top step of an interior flight of stairs, provided the door does not swing over the top step.
   1.2 Screen doors and storm doors are permitted to swing over stairs or landings.
2. Exterior doors as provided for in Section 8.3.5, Exception 1, and Section 8.17.2, which are not on an accessible route.
3. In Group R-3 occupancies, the landing at an exterior doorway shall not be more than 200 mm below the top of the threshold, provided the door, other than an exterior storm or screen door, does not swing over the landing.
4. Variations in elevation due to differences in finish materials, but not more than 12.7 mm.
5. Exterior decks, patios or balconies that are part of Type B dwelling units and have impervious surfaces, and that are not more than 100 mm below the

finished floor level of the adjacent interior space of the dwelling unit.

8.8.1.5 **Landings at doors.** Landings shall have a width not less than the width of the stairway or the door, whichever is the greater. Doors in the fully open position shall not reduce a required dimension by more than 180 mm. When a landing serves an occupant load of 50 or more, doors in any position shall not reduce the landing to less than one-half its required width. Landings shall have a length measured in the direction of travel of not less than 1.1 meters.

Exception: Landing length in the direction of travel in Group R-3 as applicable in SBC 100 and Group U and within individual units of Group R-2 as applicable in SBC 100 need not exceed 900 mm.

8.8.1.6 **Thresholds.** Thresholds at doorways shall not exceed 19 mm in height for sliding doors serving dwelling units or 12.7 mm for other doors. Raised thresholds and floor level changes greater than 6.4 mm at doorways shall be beveled with a slope not greater than one unit vertical in two units horizontal (50 percent slope).

Exception: The threshold height shall be limited to 200 mm where the occupancy is Group R-2 or R-3 as applicable in SBC the door is an exterior door that is not a component of the required means of egress and the doorway is not on an accessible route.

8.8.1.7 **Door arrangement.** Space between two doors in series shall be 1.2 meters minimum plus the width of a door swinging into the space. Doors in series shall swing either in the same direction or away from the space between doors.

Exceptions:

1. The minimum distance between horizontal sliding power-operated doors in a series shall be 1.2 meters.

2. Storm and screen doors serving individual dwelling units in Groups R-2 and R-3 as applicable in Section 101.2 need not be spaced 1.2 meters from the other door.

3. Doors within individual dwelling units in Groups R-2 and R-3 as applicable in SBC 100 other than within Type A dwelling units.

8.8.1.8 **Door operations.** Except as specifically permitted by this section egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort.

8.8.1.8.1 **Hardware.** Door handles, pulls, latches, locks and other operating devices on doors required to be accessible by Chapter 9 shall not require tight grasping, tight pinching or twisting of the wrist to operate.

8.8.1.8.2 **Hardware height.** Door handles, pulls, latches, locks and other operating devices shall be installed 860 mm minimum and 1.2 meters maximum above the finished floor. Locks used only for security purposes and not used for normal operation are permitted at any height.

8.8.1.8.3 **Locks and latches.** Locks and latches shall be permitted to prevent operation of doors where any of the following exists:

1. Places of detention or restraint.

2. In buildings in occupancy Group A having an occupant load of 300 or less, Groups B, F, M and S, and in Mosques the main exterior door or doors are permitted to be equipped with key-operated locking devices from the egress side provided:

2.1 The locking device is readily distinguishable as locked,

2.2 A readily visible durable bilingual sign *(Arabic and English)* is posted on the egress side on or adjacent to the door stating: THIS DOOR TO REMAIN UNLOCKED WHEN BUILDING IS OCCUPIED. The sign shall be in letters 25 mm high on a contrasting background,

2.3 The use of the key-operated locking device is revocable by the building

official for due cause.

3. Where egress doors are used in pairs, approved automatic flush bolts shall be permitted to be used, provided that the door leaf having the automatic flush bolts has no doorknob or surface-mounted hardware.
4. Doors from individual dwelling or sleeping units of Group R occupancies having an occupant load of 10 or less are permitted to be equipped with a night latch, dead bolt or security chain, provided such devices are openable from the inside without the use of a key or tool.

8.8.1.8.4 **Bolt locks.** Manually operated flush bolts or surface bolts are not permitted.

Exceptions:

1. On doors not required for egress in individual dwelling units or sleeping units.
2. Where a pair of doors serves a storage or equipment room, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf.

8.8.1.8.5 **Unlatching.** The unlatching of any leaf shall not require more than one operation.

Exception: More than one operation is permitted for unlatching doors in the following locations:

1. Places of detention or restraint.
2. Where manually operated bolt locks are permitted by Section 8.8.1.8.4.
3. Doors with automatic flush bolts as permitted by Section 8.8.1.8.3, Exception 3.
4. Doors from individual dwelling units and guestrooms of Group R occupancies as permitted by Section 8.8.1.8.3, Exception 4.

8.8.1.8.6 **Delayed egress locks.** Approved, listed, delayed egress locks shall be permitted to be installed on doors serving any occupancy except Group A, E and H occupancies in buildings that are equipped throughout with an automatic sprinkler system in accordance with Section 7.3.3 of SBC 801 or an approved automatic smoke or heat detection system installed in accordance with Section 7.7 of SBC 801, provided that the doors unlock in accordance with Items 1 through 6 below. A building occupant shall not be required to pass through more than one door equipped with a delayed egress lock before entering an exit.

1. The doors unlock upon actuation of the automatic sprinkler system or automatic fire detection system.
2. The doors unlock upon loss of power controlling the lock or lock mechanism.
3. The door locks shall have the capability of being unlocked by a signal from the fire command center.
4. The initiation of an irreversible process which will release the latch in not more than 15 seconds when a force of not more than 67 N is applied for 1 second to the release device. Initiation of the irreversible process shall activate an audible signal in the vicinity of the door. Once the door lock has been released by the application of force to the releasing device, relocking shall be by manual means only.

   Exception: Where approved, a delay of not more than 30 seconds is permitted.
5. A bilingual sign *(Arabic and English)* shall be provided on the door located above and within 300 mm of the release device reading: PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.
6. Emergency lighting shall be provided at the door.

8.8.1.8.7 **Stairway doors.** Interior stairway means of egress doors shall be openable from both sides without the use of a key or special knowledge or effort.

Exceptions:

1. Stairway discharge doors shall be openable from the egress side and shall only be locked from the opposite side.
2. This section shall not apply to doors arranged in accordance with Section

2.16.12.

3. In stairways serving not more than four stories, doors are permitted to be locked from the side opposite the egress side, provided they are openable from the egress side.

8.8.1.9 **Panic and fire exit hardware.** Where panic and fire exit hardware is installed, it shall comply with the following:

1. The actuating portion of the releasing device shall extend at least one-half of the door leaf width.

2. A maximum unlatching force of 67 N.

3. Each door in a means of egress from an occupancy of Group A or E having an occupant load of 100 or more and any occupancy of Group H-1, H-2, H-3 or H-5 shall not be provided with a latch or lock unless it is panic hardware or fire exit hardware.

4. If balanced doors are used and panic hardware is required, the panic hardware shall be the push-pad type and the pad shall not extend more than one-half the width of the door measured from the latch side.

8.8.2 **Gates.** Gates serving the means of egress system shall comply with the requirements of this section. Gates used as a component in a means of egress shall conform to the applicable requirements for doors.

Exception: Horizontal sliding or swinging gates exceeding the 1.2 meters maximum leaf width limitation are permitted in fences and walls surrounding a stadium.

8.8.2.1 **Stadiums.** Panic hardware is not required on gates surrounding stadiums where such gates are under constant immediate supervision while the public is present, and further provided that safe dispersal areas based on 0.28 m^2 per occupant are located between the fence and enclosed space. Such required safe dispersal areas shall not be located less than 1.5 meters from the enclosed space. See Section 8.17 for means of egress from safe dispersal areas.

8.8.3 **Turnstiles.** Turnstiles or similar devices that restrict travel to one direction shall not be placed so as to obstruct any required means of egress.

Exception: Each turnstile or similar device shall be credited with no more than a 50-person capacity where all of the following provisions are met:

1. Each device shall turn free in the direction of egress travel when primary power is lost, and upon the manual release by an employee in the area.

2. Such devices are not given credit for more than 50 percent of the required egress capacity.

3. Each device is not more than 1.0 m high.

4. Each device has at least 400 mm clear width at and below a height of 990 mm and at least 560 mm clear width at heights above 1.0 m.

5. Where located as part of an accessible route, turnstiles shall have at least 900 mm clear at and below a height of 860 mm, at least 800 mm clear width between 860 mm and 2.1 meters and shall consist of a mechanism other than a revolving device.

8.8.3.1 **High turnstile.** Turnstiles more than 1.0 m high shall meet the requirements for revolving doors.

8.8.3.2 **Additional door.** Where serving an occupant load greater than 300, each turnstile that is not portable shall have a side-hinged swinging door which conforms to Section 8.8.1 within 1.5 meters.

SECTION 8.9
STAIRWAYS AND HANDRAILS

8.9.1 **Stairway width.** The width of stairways shall be determined as specified in Section 8.5.1, but such width shall not be less than 1.1 meters. See Section 8.7.3 for accessible means of egress stairways.

Exceptions:

1. Stairways serving an occupant load of 50 or less shall have a width of not less than 900 mm.
2. Spiral stairways as provided for in Section 8.9.9.
3. Aisle stairs complying with Section 8.24.
4. Where a stairway lift is installed on stairways serving occupancies in Group R-3, or within dwelling units in occupancies in Group R-2, both as applicable in SBC 100 a clear passage width not less than 510 mm shall be provided. If the seat and platform can be folded when not in use, the distance shall be measured from the folded position.

8.9.2 **Headroom.** Stairways shall have a minimum headroom clearance of 2.1 meters measured vertically from a line connecting the edge of the nosings. Such headroom shall be continuous above the stairway to the point where the line intersects the landing below, one tread depth beyond the bottom riser. The minimum clearance shall be maintained the full width of the stairway and landing.

Exception: Spiral stairways complying with Section 8.9.9 are permitted a 2.0 meters headroom clearance.

8.9.3 **Stair treads and risers.** Stair riser heights shall be 180 mm maximum and 100 mm minimum. Stair tread depths shall be 280 mm minimum. The riser height shall be measured vertically between the leading edges of adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 9.5 mm. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 9.5 mm. Winder treads shall have a minimum tread depth of 280 mm measured at a right angle to the tread's leading edge at a point 300 mm from the side where the treads are narrower and a minimum tread depth of 250 mm. The greatest winder tread depth at the 300 mm walk line within any flight of stairs shall not exceed the smallest by more than 9.5 mm.

Exceptions:

1. Circular stairways in accordance with Section 8.9.7.
2. Winders in accordance with Section 8.9.8.
3. Spiral stairways in accordance with Section 8.9.9.
4. Aisle stairs in assembly seating areas where the stair pitch or slope is set, for sightline reasons, by the slope of the adjacent seating area in accordance with Section 8.24.11.2.
5. In occupancies in Group R-3, as applicable in Section 101.2, within dwelling units in occupancies in Group R-2, as applicable in Section 101.2, and in occupancies in Group U, which are accessory to an occupancy in Group R-3, as applicable in Section 101.2, the maximum riser height shall be 200 mm and the minimum tread depth shall be 250 mm, the minimum winder tread depth at the walk line shall be 250 mm, and the minimum winder tread depth shall be 150 mm. A nosing not less than 19 mm but not more than 32 mm shall be provided on stairways with solid risers where the tread depth is less than 280

mm.

6. See Chapter 13 for the replacement of existing stairways.

8.9.3.1 **Dimensional uniformity.** Stair treads and risers shall be of uniform size and shape. The tolerance between the largest and smallest riser or between the largest and smallest tread shall not exceed 9.5 mm in any flight of stairs.

Exceptions:

1. No uniform riser dimensions of aisle stairs complying with Section 8.24.11.2.
2. Consistently shaped winders, complying with Section 8.9.8, differing from rectangular treads in the same stairway flight.

Where the bottom or top riser adjoins a sloping public way, walkway or driveway having an established grade and serving as a landing, the bottom or top riser is permitted to be reduced along the slope to less than 100 mm in height with the variation in height of the bottom or top riser not to exceed one unit vertical in 12 units horizontal (8 percent slope) of stairway width. The nosings or leading edges of treads at such no uniform height risers shall have a distinctive marking stripe, different from any other nosing marking provided on the stair flight. The distinctive marking stripe shall be visible in descent of the stair and shall have a slip-resistant surface. Marking stripes shall have a width of at least 25 mm but not more than 50 mm.

8.9.3.2 **Profile.** The radius of curvature at the leading edge of the tread shall be not greater than 12.7 mm. Beveling of nosings shall not exceed 12.7 mm. Risers shall be solid and vertical or sloped from the underside of the leading edge of the tread above at an angle not more than 30 degrees from the vertical. The leading edge (nosings) of treads shall project not more than 30 mm beyond the tread below and all projections of the leading edges shall be of uniform size, including the leading edge of the floor at the top of a flight.

Exceptions:

1. Solid risers are not required for stairways that are not required to comply with Section 8.7.3, provided that the opening between treads does not permit the passage of a sphere with a diameter of 100 mm.
2. Solid risers are not required for occupancies in Group I-3.

8.9.4 **Stairway landings.** There shall be a floor or landing at the top and bottom of each stairway. The width of landings shall not be less than the width of stairways they serve. Every landing shall have a minimum dimension measured in the direction of travel equal to the width of the stairway. Such dimension need not exceed 1.2 meters where the stairway has a straight run.

Exceptions:

1. Aisle stairs complying with Section 8.24.
2. Doors opening onto a landing shall not reduce the landing to less than one-half the required width. When fully open, the door shall not project more than 180 mm into a landing.

8.9.5 **Stairway construction.** All stairways shall be built of materials consistent with the types permitted for the type of construction of the building, except that wood handrails shall be permitted for all types of construction.

8.9.5.1 **Stairway walking surface.** The walking surface of treads and landings of a stairway shall not be sloped steeper than one unit vertical in 48 units horizontal (2 percent slope) in any direction. Stairway treads and landings shall have a solid surface. Finish floor surfaces shall be securely attached.

Exception: In Groups F, H and S occupancies, other than areas of parking structures accessible to the public, openings in treads and landings shall not be

prohibited provided a sphere with a diameter of 30 mm cannot pass through the opening.

8.9.5.2 **Outdoor conditions.** Outdoor stairways and outdoor approaches to stairways shall be designed so that water will not accumulate on walking surfaces. In other than occupancies in Group R-3, and occupancies in Group U that are accessory to an occupancy in Group R-3, treads.

8.9.6 **Vertical rise.** A flight of stairs shall not have a vertical rise greater than 3.7 meters between floor levels or landings.
Exception: Aisle stairs complying with Section 8.24.

8.9.7 **Circular stairways.** Circular stairways shall have a minimum tread depth and a maximum riser height in accordance with Section 8.9.3 and the smaller radius shall not be less than twice the width of the stairway. The minimum tread depth measured 300 mm from the narrower end of the tread shall not be less than 280 mm. The minimum tread depth at the narrow end shall not be less than 250 mm.
Exception: For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, both as applicable in SBC.

8.9.8 **Winders.** Winders are not permitted in means of egress stairways except within a dwelling unit.

8.9.9 **Spiral stairways.** Spiral stairways are permitted to be used as a component in the means of egress only within dwelling units or from a space not more than 23 m^2 in area and serving not more than five occupants, or from galleries, catwalks and gridirons in accordance with Section 8.14.6.
A spiral stairway shall have a 190 mm minimum clear tread depth at a point 300 mm from the narrow edge. The risers shall be sufficient to provide a headroom of 2.0 m minimum, but riser height shall not be more than 240 mm. The minimum stairway width shall be 660 mm.

8.9.10 **Alternating tread devices.** Alternating tread devices are limited to an element of a means of egress in buildings of Groups F, H and S from a mezzanine not more than 23 m^2 in area and which serves not more than five occupants; in buildings of Group I-3 from a guard tower, observation station or control room not more than 23 m^2 in area and for access to unoccupied roofs.

8.9.10.1 **Handrails of alternating tread devices.** Handrails shall be provided on both sides of alternating tread devices and shall conform to Section 8.9.11.

8.9.10.2 **Treads of alternating tread devices.** Alternating tread devices shall have a minimum projected tread of 125 mm, a minimum tread depth of 215 mm, a minimum tread width of 180 mm and a maximum riser height of 240 mm. The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.
Exception: Alternating tread devices used as an element of a means of egress in buildings from a mezzanine area not more than 23 m^2 in area which serves not more than five occupants shall have a minimum projected tread of 215 mm with a minimum tread depth of 270 mm. The rise to the next alternating tread surface should not be more than 200 mm.

8.9.11 **Handrails.** Stairways shall have handrails on each side. Handrails shall be adequate in strength and attachment in accordance with Section 2.7 of SBC 301. Handrails for ramps, where required by Section 8.10.8, shall comply with this

section.

Exceptions:

1. Aisle stairs complying with Section 8.24 provided with a center handrail need not have additional handrails.
2. Stairways within dwelling units, spiral stairways and aisle stairs serving seating only on one side are permitted to have a handrail on one side only.
3. Decks, patios and walkways that have a single change in elevation where the landing depth on each side of the change of elevation is greater than what is required for a landing do not require handrails.
4. In Group R-3 occupancies, a change in elevation consisting of a single riser at an entrance or egress door does not require handrails.
5. Changes in room elevations of only one riser within dwelling units and sleeping units in Group R-2 and R-3 occupancies do not require handrails.

8.9.11.1 **Height.** Handrail height, measured above stair tread nosings, or finish surface of ramp slope, shall be uniform, not less than 860 mm and not more than 960 mm.

8.9.11.2 **Intermediate handrails.** Intermediate handrails are required so that all portions of the stairway width required for egress capacity are within 750 mm of a handrail. On monumental stairs, handrails shall be located along the most direct path of egress travel.

8.9.11.3 **Handrail graspability.** Handrails with a circular cross section shall have an outside diameter of at least 32 mm and not greater than 50 mm or shall provide equivalent graspability. If the handrail is not circular, it shall have a perimeter dimension of at least 100 mm and not greater than 160 mm with a maximum cross-section dimension of 55 mm. Edges shall have a minimum radius of 0.25 mm.

8.9.11.4 **Continuity.** Handrail-gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.

Exceptions:

1. Handrails within dwelling units are permitted to be interrupted by a newel post at a stair landing.
2. Within a dwelling unit, the use of a volute, turnout or starting easing is allowed on the lowest tread.
3. Handrail brackets or balusters attached to the bottom surface of the handrail that do not project horizontally beyond the sides of the handrail within 38 mm of the bottom of the handrail shall not be considered to be obstructions and provided further that for each 13 mm of additional handrail perimeter dimension above 100 mm, the vertical clearance dimension of 38 mm shall be permitted to be reduced by 3 mm.

8.9.11.5 **Handrail extensions.** Handrails shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stair flight. Where handrails are not continuous between flights, the handrails shall extend horizontally at least 300 mm beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser.

Exceptions:

1. Handrails within a dwelling unit that is not required to be accessible need extend only from the top riser to the bottom riser.
2. Aisle handrails in Group A occupancies in accordance with Section 8.24.13.

8.9.11.6 **Clearance.** Clear space between a handrail and a wall or other surface shall be a minimum of 38 mm. A handrail and a wall or other surface adjacent to the handrail shall be free of any sharp or abrasive elements.

8.9.11.7 **Stairway projections.** Projections into the required width at each handrail shall not exceed 115 mm at or below the handrail height. Projections into the required

width shall not be limited above the minimum headroom height required in Section 8.9.2.

8.9.12 **Stairway to roof.** In buildings four or more stories in height above grade, one stairway shall extend to the roof surface, unless the roof has a slope steeper than four units vertical in 12 units horizontal (33 percent slope). In buildings without an occupied roof, access to the roof from the top story shall be permitted to be by an alternating tread device.

8.9.12.1 **Roof access.** Where a stairway is provided to a roof, access to the roof shall be provided through a penthouse complying with Section 6.9.2.

Exception: In buildings without an occupied roof, access to the roof shall be permitted to be a roof hatch or trap door not less than 1.5 m^2 in area and having a minimum dimension of 600 mm.

SECTION 8.10
RAMPS

8.10.1 **Scope.** The provisions of this section shall apply to ramps used as a component of a means of egress.

Exceptions:

1. Other than ramps that are part of the accessible routes providing access in accordance with Sections 9.8.2.2 through 9.8.2.4.1, ramped aisles within assembly rooms or spaces shall conform with the provisions in Section 8.24.11.
2. Curb ramps shall comply with ICC A117.1.
3. Vehicle ramps in parking garages for pedestrian exit access shall not be required to comply with Sections 8.10.3 through 8.10.9 when they are not an accessible route serving accessible parking spaces, other required accessible elements or part of an accessible means of egress.

8.10.2 **Slope.** Ramps used as part of a means of egress shall have a running slope not steeper than one unit vertical in 12 units horizontal (8 percent slope). The slope of other ramps shall not be steeper than one unit vertical in eight units horizontal (12.5 percent slope).

Exception: Aisle ramp slope in occupancies of Group A shall comply with Section 8.24.11.

8.10.3 **Cross slope.** The slope measured perpendicular to the direction of travel of a ramp shall not be steeper than one unit vertical in 48 units horizontal (2 percent slope).

8.10.4 **Vertical rise.** The rise for any ramp run shall be 750 mm maximum.

8.10.5 **Minimum dimensions.** The minimum dimensions of means of egress ramps shall comply with Sections 8.10.5.1 through 8.10.5.3.

8.10.5.1 **Width.** The minimum width of a means of egress ramp shall not be less than that required for corridors by Section 8.16.2. The clear width of a ramp and the clear width between handrails, if provided, shall be 900 mm minimum.

8.10.5.2 **Headroom.** The minimum headroom in all parts of the means of egress ramp shall not be less than 2.1 meters.

8.10.5.3 **Restrictions.** Means of egress ramps shall not reduce in width in the direction of egress travel. Projections into the required ramp and landing width are prohibited. Doors opening onto a landing shall not reduce the clear width to less than 1.1 meters.

8.10.6 **Landings.** Ramps shall have landings at the bottom and top of each ramp, points of turning, entrance, exits and at doors. Landings shall comply with Sections 8.10.6.1 through 8.10.6.5.

8.10.6.1 **Slope.** Landings shall have a slope not steeper than one unit vertical in 48 units horizontal (2 percent slope) in any direction. Changes in level are not permitted.

8.10.6.2 **Width.** The landing shall be at least as wide as the widest ramp run adjoining the landing.

8.10.6.3 **Length.** The landing length shall be 1520 mm minimum.

Exception: Landings in non-accessible Group R-2 and R-3 individual dwelling units, as applicable in SBC 100 are permitted to be 900 mm minimum.

8.10.6.4 **Change in direction.** Where changes in direction of travel occur at landings provided between ramp runs, the landing shall be 1.5 meters by 1.5 meters minimum.

Exception: Landings in non-accessible Group R-2 and R-3 individual dwelling units, as applicable in SBC 100 are permitted to be 900 mm by 900 mm minimum.

8.10.6.5 **Doorways.** Where doorways are located adjacent to a ramp landing, maneuvering clearances required by ICC A117.1 are permitted to overlap the required landing area.

8.10.7 **Ramp construction.** All ramps shall be built of materials consistent with the types permitted for the type of construction of the building; except that wood handrails shall be permitted for all types of construction. Ramps used as an exit shall conform to the applicable requirements of Sections 8.19.1 and 8.19.1.1 through 8.19.1.3 for vertical exit enclosures.

8.10.7.1 **Ramp surface.** The surface of ramps shall be of slip-resistant materials that are securely attached.

8.10.7.2 **Outdoor conditions.** Outdoor ramps and outdoor approaches to ramps shall be designed so that water will not accumulate on walking surfaces.

8.10.8 **Handrails.** Ramps with a rise greater than 150 mm shall have handrails on both sides complying with Section 8.9.11.

8.10.9 **Edge protection.** Edge protection complying with Section 8.10.9.1 or 8.10.9.2 shall be provided on each side of ramp runs and at each side of ramp landings.

Exceptions:

1. Edge protection is not required on ramps not required to have handrails, provided they have flared sides that comply with the ICC A117.1 curb ramp provisions.
2. Edge protection is not required on the sides of ramp landings serving an adjoining ramp run or stairway.
3. Edge protection is not required on the sides of ramp landings having a vertical drop-off of not more than 13 mm within 250 mm horizontally of the required landing area.

8.10.9.1 **Railings.** A rail shall be mounted below the handrail 430 mm to 480 mm above the ramp or landing surface.

8.10.9.2 **Curb or barrier.** A curb or barrier shall be provided that prevents the passage of a 100 mm sphere, where any portion of the sphere is within 100 mm of the floor or ground surface.

8.10.10 **Guards.** Guards shall be provided where required by Section 8.12 and shall be constructed in accordance with Section 8.12.

SECTION 8.11
EXIT SIGNS

8.11.1 **Where required.** Exits and exit access doors shall be marked by an approved exit bilingual sign *(Arabic and English)* readily visible from any direction of egress travel. Access to exits shall be marked by readily visible exit signs in cases where the exit or the path of egress travel is not immediately visible to the occupants. Exit sign placement shall be such that no point in an exit access corridor is more than 30.5 meters or the listed viewing distance for the sign, whichever is less, from the nearest visible exit sign.

Exceptions:

1. Exit bilingual signs *(Arabic and English)* are not required in rooms or areas which require only one exit or exit access.
2. Main exterior exit doors or gates which obviously and clearly are identifiable as exits need not have exit signs where approved by the concerned building official.
3. Exit signs are not required in occupancies in Group U and individual sleeping units or dwelling units in Group R-1, R-2 or R-3.
4. Exit signs are not required in sleeping areas in occupancies in Group I-3.
5. In occupancies in Groups A-4 and A-5, exit signs are not required on the seating side of vomitories or openings into seating areas where exit signs are provided in the concourse that are readily apparent from the vomitories. Egress lighting is provided to identify each vomitory or opening within the seating area in an emergency.

8.11.2 **Illumination.** Exit signs shall be internally or externally illuminated.
Exception: Tactile signs required by Section 8.11.3 need not be provided with illumination.

8.11.3 **Tactile exit signs.** A tactile bilingual sign *(Arabic and English)* stating EXIT and complying with ICC A117.1 shall be provided adjacent to each door to an egress stairway, an exit passageway and the exit discharge.

8.11.4 **Internally illuminated exit signs.** Internally illuminated exit signs shall be listed and labeled and shall be installed in accordance with the manufacturer's instructions and SBC 401. Exit signs shall be illuminated at all times.

8.11.5 **Externally illuminated exit signs.** Externally illuminated exit signs shall comply with Sections 8.11.5.1 through 8.11.5.3.

8.11.5.1 **Graphics.** Every exit sign and directional exit sign shall have plainly legible letters not less than 150 mm high with the principal strokes of the letters not less than 19 mm wide. The word "EXIT" shall be bilingual *(Arabic and English) and* have letters having a width not less than 50 mm wide except the letter "I," and the minimum spacing between letters shall not be less than 9.5 mm. Signs larger than the minimum established in this section shall have letter widths, strokes and spacing in proportion to their height. The word "EXIT" shall be in high contrast with the background and shall be clearly discernible when the exit sign illumination means is or is not energized. If an arrow is provided as part of the exit sign, the construction shall be such that the arrow direction cannot be readily changed.

8.11.5.2 **Exit sign illumination.** The face of an exit sign illuminated from an external source shall have an intensity of not less than 54 lux.

8.11.5.3 **Power source.** Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with SBC 401.

Exception: Approved exit sign illumination means that provide continuous illumination independent of external power sources for a duration of not less than 90 minutes, in case of primary power loss, are not required to be connected to an emergency electrical system.

SECTION 8.12
GUARDS

8.12.1 **Where required.** Guards shall be located along open-sided walking surfaces, mezzanines, industrial equipment platforms, stairways, ramps and landings which are located more than 750 mm above the floor or grade below. Guards shall be adequate in strength and attachment in accordance with SBC 301. Guards shall also be located along glazed sides of stairways, ramps and landings that are located more than 750 mm above the floor or grade below where the glazing provided does not meet the strength and attachment requirements in SBC 301.

Exception: Guards are not required for the following locations:

1. On the loading side of loading docks or piers.
2. On the audience side of stages and raised platforms, including steps leading up to the stage and raised platforms.
3. On raised stage and platform floor areas such as runways, ramps and side stages used for entertainment or presentations.
4. At vertical openings in the performance area of stages and platforms.
5. At elevated walking surfaces appurtenant to stages and platforms for access to and utilization of special lighting or equipment.
6. Along vehicle service pits not accessible to the public.
7. In assembly seating where guards in accordance with Section 8.24.14 are permitted and provided.

8.12.2 **Height.** Guards shall form a protective barrier not less than 1.1 meters high, measured vertically above the leading edge of the tread, adjacent walking surface or adjacent seatboard.

Exceptions:

1. For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, both as applicable in SBC 100 guards whose top rail also serves as a handrail shall have a height not less than 860 mm and not more than 960 mm measured vertically from the leading edge of the stair tread nosing.
2. The height in assembly seating areas shall be in accordance with Section 8.24.14.

8.12.3 **Opening limitations.** Open guards shall have balusters or ornamental patterns such that a 100 mm sphere cannot pass through any opening up to a height of 860 mm. From a height of 860 mm to 1070 mm above the adjacent walking surfaces, a sphere 200 mm in diameter shall not pass.

Exceptions:

1. The triangular openings formed by the riser, tread and bottom rail at the open

side of a stairway shall be of a maximum size such that a sphere of 150 mm in diameter cannot pass through the opening.

2. At elevated walking surfaces for access to and use of electrical, mechanical or plumbing systems or equipment, guards shall have balusters or be of solid materials such that a sphere with a diameter of 530 mm cannot pass through any opening.
3. In areas which are not open to the public within occupancies in Group I-3, F, H or S, balusters, horizontal intermediate rails or other construction shall not permit a sphere with a diameter of 530 mm to pass through any opening.
4. In assembly seating areas, guards at the end of aisles where they terminate at a fascia of boxes, balconies and galleries shall have balusters or ornamental patterns such that a 100 mm-diameter sphere cannot pass through any opening up to a height of 660 mm. From a height of 660 mm to 1070 mm above the adjacent walking surfaces, a sphere 200 mm in diameter shall not pass.

8.12.4 **Screen porches.** Porches and decks which are enclosed with insect screening shall be provided with guards where the walking surface is located more than 750 mm above the floor or grade below.

8.12.5 **Mechanical equipment.** Guards shall be provided where appliances, equipment, fans or other components that require service are located within 3 meters of a roof edge or open side of a walking surface and such edge or open side is located more than 750 mm above the floor, roof or grade below. The guard shall be constructed so as to prevent the passage of a 530 mm-diameter sphere.

SECTION 8.13
EXIT ACCESS

8.13.1 **General.** The exit access arrangement shall comply with Sections 8.13 through 8.16 and the applicable provisions of Sections 8.3 through 8.12.

8.13.2 **Egress through intervening spaces.** Egress from a room or space shall not pass through adjoining or intervening rooms or areas, except where such adjoining rooms or areas are accessory to the area served; are not a high-hazard occupancy and provide a discernible path of egress travel to an exit. Egress shall not pass through kitchens, storage rooms, closets or spaces used for similar purposes. An exit access shall not pass through a room that can be locked to prevent egress. Means of egress from dwelling units or sleeping areas shall not lead through other sleeping areas, toilet rooms or bathrooms.

Exceptions:

1. Means of egress are not prohibited through a kitchen area serving adjoining rooms constituting part of the same dwelling unit or sleeping unit.
2. Means of egress are not prohibited through adjoining or intervening rooms or spaces in a Group H occupancy when the adjoining or intervening rooms or spaces are the same or a lesser hazard occupancy group.

8.13.2.1 **Multiple tenants.** Where more than one tenant occupies any one floor of a building or structure, each tenant space, dwelling unit and sleeping unit shall be provided with access to the required exits without passing through adjacent tenant spaces, dwelling units and sleeping units.

8.13.2.2 **Group I-2.** Habitable rooms or suites in Group I-2 occupancies shall have an exit access door leading directly to an exit access corridor.

Exceptions:

1. Rooms with exit doors opening directly to the outside at ground level.
2. Patient sleeping rooms are permitted to have one intervening room if the intervening room is not used as an exit access for more than eight patient beds.
3. Special nursing suites are permitted to have one intervening room where the arrangement allows for direct and constant visual supervision by nursing personnel.
4. For rooms other than patient sleeping rooms, suites of rooms are permitted to have one intervening room if the travel distance within the suite to the exit access door is not greater than 30.5 meters and are permitted to have two intervening rooms where the travel distance within the suite to the exit access door is not greater than 15.3 meters.

   Suites of sleeping rooms shall not exceed 465 m^2. Suites of rooms, other than patient sleeping rooms, shall not exceed 929 m^2. Any patient sleeping room, or any suite that includes patient sleeping rooms, of more than 93 m^2 shall have at least two exit access doors remotely located from each other. Any room or suite of rooms, other than patient sleeping rooms, of more than 232 m^2 shall have at least two access doors remotely located from each other. The travel distance between any point in a Group I-2 occupancy and an exit access door in the room shall not exceed 15.3 meters. The travel distance between any point in a suite of sleeping rooms and an exit access door of that suite shall not exceed 30.5 meters.

8.13.3 **Common path of egress travel.** In occupancies other than Groups H-1, H-2 and H-3, the common path of egress travel shall not exceed 23.0 meters. In occupancies in Groups H-1, H-2, and H-3, the common path of egress travel shall not exceed 7.6 meters.

Exceptions:

1. The length of a common path of egress travel in an occupancy in Groups B, F and S shall not be more than 30.5 meters, provided that the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801.
2. Where a tenant space in an occupancy in Groups B, S and U has an occupant load of not more than 30, the length of a common path of egress travel shall not be more than 30.5 meters.
3. The length of a common path of egress travel in occupancies in Group I-3 shall not be more than 30.5 meters.

8.13.4 **Aisles.** Aisles serving as a portion of the exit access in the means of egress system shall comply with the requirements of this section. Aisles shall be provided from all occupied portions of the exit access which contain seats, tables, furnishings, displays and similar fixtures or equipment. Aisles serving assembly areas, other than seating at tables, shall comply with Section 8.24. Aisles serving reviewing stands, grandstands and bleachers shall also comply with Section 8.24.

The required width of aisles shall be unobstructed.

Exception: Doors, when fully opened, and handrails shall not reduce the required width by more than 180 mm. Doors in any position shall not reduce the required width by more than one-half. Other nonstructural projections such as trim and similar decorative features are permitted to project into the required width 38 mm from each side.

8.13.4.1 **Groups B and M.** In Group B and M occupancies, the minimum clear aisle width shall be determined by Section 8.5.1 for the occupant load served, but shall not be less than 900 mm.

Exception: Nonpublic aisles serving less than 50 people, and not required to be accessible by Chapter 9 need not exceed 710 mm in width.

8.13.4.2 **Seating at tables.** Where seating is located at a table or counter and is adjacent to an aisle or aisle access way, the measurement of required clear width of the aisle or aisle accessway shall be made to a line 480 mm away from and parallel to the edge of the table or counter. The 480 mm distance shall be measured perpendicular to the side of the table or counter. In the case of other side boundaries for aisle or aisle access ways, the clear width shall be measured to walls, edges of seating and tread edges, except that handrail projections are permitted.

Exception: Where tables or counters are served by fixed seats, the width of the aisle accessway shall be measured from the back of the seat.

8.13.4.2.1 **Aisle accessway for tables and seating.** Aisle access ways serving arrangements of seating at tables or counters shall have sufficient clear width to conform to the capacity requirements of Section 8.5.1 but shall not have less than the appropriate minimum clear width specified in Section 8.13.4.1.

8.13.4.2.2 **Table and seating accessway width.** Aisle accessways shall provide a minimum of 300 mm of width plus 12.7 mm of width for each additional 300 mm, or fraction thereof, beyond 3.7 meters of aisle accessway length measured from the center of the seat farthest from an aisle.

Exception: Portions of an aisle accessway having a length not exceeding 1800 mm and used by a total of not more than four persons.

8.13.4.2.3 **Table and seating aisle accessway length.** The length of travel along the aisle accessway shall not exceed 9.2 meters from any seat to the point where a person has a choice of two or more paths of egress travel to separate exits.

8.13.5 **Egress balconies.** Balconies used for egress purposes shall conform to the same requirements as corridors for width, headroom, dead ends and projections.

8.13.5.1 **Wall separation.** Exterior egress balconies shall be separated from the interior of the building by walls and opening protectives as required for corridors.

Exception: Separation is not required where the exterior egress balcony is served by at least two stairs and a dead-end travel condition does not require travel past an unprotected opening to reach a stair.

8.13.5.2 **Openness.** The long side of an egress balcony shall be at least 50 percent open, and the open area above the guards shall be so distributed as to minimize the accumulation of smoke or toxic gases.

SECTION 8.14
EXIT AND EXIT ACCESS DOORWAYS

8.14.1 **Exit or exit access doorways required.** Two exits or exit access doorways from any space shall be provided where one of the following conditions exists:

1. The occupant load of the space exceeds the values in Table 8.14.1.

2. The common path of egress travel exceeds the limitations of Section 8.13.3.

3. Where required by Sections 8.14.3, 8.14.4 and 8.14.5.

Exception: Group I-2 occupancies shall comply with Section 8.13.2.2.

TABLE 8.14.1
SPACES WITH ONE MEANS OF EGRESS

OCCUPANCY	MAXIMUM OCCUPANT LOAD
A, B, E, F, M, U	50
H-1, H-2, H-3	3
H-4, H-5, I-1, I-3, I-4, R	10
S	30

8.14.1.1 **Three or more exits.** Access to three or more exits shall be provided from a floor area where required by Section 8.18.1.

8.14.2 **Exit or exit access doorway arrangement.** Required exits shall be located in a manner that makes their availability obvious. Exits shall be unobstructed at all times. Exit and exit access doorways shall be arranged in accordance with Sections 8.14.2.1 and 8.14.2.2.

8.14.2.1 **Two exits or exit access doorways.** Where two exits or exit access doorways are required from any portion of the exit access, the exit doors or exit access doorways shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the building or area to be served measured in a straight line between exit doors or exit access doorways. Interlocking or scissor stairs shall be counted as one exit stairway.

Exceptions:

1. Where exit enclosures are provided as a portion of the required exit and are interconnected by a 1 hour fire-resistance-rated corridor conforming to the requirements of Section 8.16, the required exit separation shall be measured along the shortest direct line of travel within the corridor.
2. Where a building is equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 the separation distance of the exit doors or exit access doorways shall not be less than one-third of the length of the maximum overall diagonal dimension of the area served.

8.14.2.2 **Three or more exits or exit access doorways.** Where access to three or more exits is required, at least two exit doors or exit access doorways shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the area served measured in a straight line between such exit doors or exit access doorways. Additional exits or exit access doorways shall be arranged a reasonable distance apart so that if one becomes blocked, the others will be available.

Exception: Where a building is equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 the separation distance of at least two of the exit doors or exit access doorways shall not be less than one-third of the length of the maximum overall diagonal dimension of the area served.

8.14.3 **Boiler, incinerator and furnace rooms.** Two exit access doorways are required in boiler, incinerator and furnace rooms where the area is over 46 m^2 and any fuel-fired equipment exceeds 422 000 input capacity. Where two exit access doorways are required, one is permitted to be a fixed ladder or an alternating tread device. Exit access doorways shall be separated by a horizontal distance equal to one-half the maximum horizontal dimension of the room.

8.14.4 **Refrigeration machinery rooms.** Machinery rooms larger than 93 m^2 shall have not less than two exits or exit access doors. Where two exit access doorways are required, one such doorway is permitted to be served by a fixed ladder or an alternating tread device. Exit access doorways shall be separated by a horizontal distance equal to one-half the maximum horizontal dimension of room.

All portions of machinery rooms shall be within 45.7 meters of an exit or exit access doorway. An increase in travel distance is permitted in accordance with Section 8.15.1.

Doors shall swing in the direction of egress travel, regardless of the occupant load served. Doors shall be tight fitting and self-closing.

8.14. 5 **Refrigerated rooms or spaces.** Rooms or spaces having a floor area of 93 m^2 or more, containing a refrigerant evaporator and maintained at a temperature below 20°C shall have access to not less than two exits or exit access doors.

Travel distance shall be determined as specified in Section 8.15.1, but all portions of a refrigerated room or space shall be within 45.7 meters of an exit or exit access door where such rooms are not protected by an approved automatic sprinkler system. Egress is allowed through adjoining refrigerated rooms or spaces.

Exception: Where using refrigerants in quantities limited to the amounts based on the volume set forth in the SBC 501.

8.14.6 **Stage means of egress.** Where two means of egress are required, based on the stage size or occupant load, one means of egress shall be provided on each side of the stage.

8.14.6.1 **Gallery, gridiron and catwalk means of egress.** The means of egress from lighting and access catwalks, galleries and gridirons shall meet the requirements for occupancies in Group F-2.

Exceptions:

1. A minimum width of 560 mm is permitted for lighting and access catwalks.
2. Spiral stairs are permitted in the means of egress.
3. Stairways required by this subsection need not be enclosed.
4. Stairways with a minimum width of 560 mm, ladders, or spiral stairs are permitted in the means of egress.
5. A second means of egress is not required from these areas where a means of escape to a floor or to a roof is provided. Ladders, alternating tread devices or spiral stairs are permitted in the means of escape.
6. Ladders are permitted in the means of egress.

SECTION 8.15
EXIT ACCESS TRAVEL DISTANCE

8.15.1 **Travel distance limitations.** Exits shall be so located on each story such that the maximum length of exit access travel, measured from the most remote point within a story to the entrance to an exit along the natural and unobstructed path of egress travel, shall not exceed the distances given in Table 8.15.1.

Where the path of exit access includes unenclosed stairways or ramps within the exit access or includes unenclosed exit ramps or stairways as permitted in Section 8.19.1, the distance of travel on such means of egress components shall also be included in the travel distance measurement. The measurement along stairways shall be made on a plane parallel and tangent to the stair tread nosings in the center of the stairway.

TABLE 8.15.1
EXIT ACCESS TRAVEL DISTANCE[a]

OCCUPANCY	WITHOUT SPRINKLER SYSTEM (meters)	WITH SPRINKLER SYSTEM (meters)
A, E, F-1, I-1, M, R, S-1	6.1	7.6 [b]
B	6.1	9.2[c]
F-2, S-2, U	9.2	12.2[b]
H-1	Not Permitted	23[c]
H-2	Not Permitted	30[c]
H-3	Not Permitted	45.5[c]
H-4	Not Permitted	53[c]
H-5	Not Permitted	61[c]
I-2, I-3, I-4	45500 (150)	61[c]

a. See the following sections for modifications to exit access travel distance requirements:
Section 2.15: For the distance limitation in malls.
Section 2.17: For the distance limitation through an atrium space.
Section 8.15.2: For increased limitation in Groups F-1 and S-1.
Section 8.24.7: For increased limitation in assembly seating.
Section 8.24.7: For increased limitation for assembly open-air seating.
Section 8.18.2: For buildings with one exit.
Section 4.4: For the limitation in temporary structures.

b. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 for occupancies where sprinkler systems according to Section 7.3 of SBC 801 are permitted.

c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801.

Exceptions:

1. Travel distance in open parking garages is permitted to be measured to the closest riser of open stairs.
2. In outdoor facilities with open exit access components and open exterior stairs or ramps, travel distance is permitted to be measured to the closest riser of a stair or the closest slope of the ramp.
3. Where an exit stair is permitted to be unenclosed in accordance with Exception 8 or 9 of Section 8.19.1, the travel distance shall be measured from the most remote point within a building to an exit discharge.

8.15.2 **Roof vent increase.** In buildings which are one story in height, equipped with automatic heat and smoke roof vents complying with Section 7.10 of SBC 801 and equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 the maximum exit access travel distance shall be 122 m for occupancies in Group F-1 or S.

8.15.3 **Exterior egress balcony increase.** Travel distances specified in Section 8.15.1 shall be increased up to an additional 30 meters provided the last portion of the exit access leading to the exit occurs on an exterior egress balcony constructed in accordance with Section 8.13.5. The length of such balcony shall not be less than the amount of the increase taken.

SECTION 8.16
CORRIDORS

8.16.1 **Construction.** Corridors shall be fire-resistance rated in accordance with Table 8.16.1. The corridor walls required to be fire-resistance rated shall comply with Section 4.9 of SBC 801 for fire partitions.

Exceptions:

1. A fire-resistance rating is not required for corridors in an occupancy in Group E where each room that is used for instruction has at least one door directly to the exterior and rooms for assembly purposes have at least one-half of the required means of egress doors opening directly to the exterior. Exterior doors specified in this exception are required to be at ground level.
2. A fire-resistance rating is not required for corridors contained within a dwelling or sleeping unit in an occupancy in Group R.
3. A fire-resistance rating is not required for corridors in open parking garages.
4. A fire-resistance rating is not required for corridors in an occupancy in Group B which is a space requiring only a single means of egress complying with Section 8.14.1.

8.16.2 **Corridor width.** The minimum corridor width shall be as determined in Section 8.5.1, but not less than 1.1 meters.

Exceptions:

1. 600 mm – For access to and utilization of electrical, mechanical or plumbing systems or equipment.
2. 900 mm – With a required occupant capacity of 50 or less.
3. 900 mm – Within a dwelling unit.
4. 1.8 meters – In Group E with a corridor having a required capacity of 100 or more.
5. 1.8 meters – In corridors serving surgical Group I, health care centers for ambulatory patients receiving outpatient medical care, which causes the patient to be not capable of self-preservation.
6. 2.4 meters – In Group I-2 in areas where required for bed movement.

8.16.3 **Dead ends.** Where more than one exit or exit access doorway is required, the exit access shall be arranged such that there are no dead ends in corridors more than 6.1 meters in length.

Exceptions:

1. In occupancies in Group I-3 of Occupancy Condition 2, 3 or 4 (see Section 2.8.4), the dead end in a corridor shall not exceed 1.5 meters.
2. In occupancies in Groups B and F where the building is equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 the length of dead-end corridors shall not exceed 1.5 meters.
3. A dead-end corridor shall not be limited in length where the length of the dead-end corridor is less than 2.5 times the least width of the dead-end corridor.

TABLE 8.16.1
CORRIDOR FIRE-RESISTANCE RATING

OCCUPANCY	OCCUPANT LOAD SERVED BY CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler system[c]
H-1, H-2, H-3	All	Not Permitted	1
H-4, H-5	Greater than 30	Not Permitted	1
A, B, E, F, M, S, U	Greater than 30	1	0
R	Greater than 10	1	0.5
I-2[a], I-4	All	Not Permitted	0
I-1, I-3	All	Not Permitted	1[b]

a. For requirements for occupancies in Group I-2, see Section 2.20.3.
b. For a reduction in the fire-resistance rating for occupancies in Group I-3, see Section 2.21.7.
c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 where allowed.

8.16.4 **Air movement in corridors.** Exit access corridors shall not serve as supply, return, exhaust, relief or ventilation air ducts or plenums.

Exceptions:

1. Use of a corridor as a source of makeup air for exhaust systems in rooms that open directly onto such corridors, including toilet rooms, bathrooms, dressing rooms, smoking lounges and janitor closets, shall be permitted provided that each such corridor is directly supplied with outdoor air at a rate greater than the rate of makeup air taken from the corridor.
2. Where located within a dwelling unit, the use of corridors for conveying return air shall not be prohibited.
3. Where located within tenant spaces of 93 m^2 or less in area, utilization of corridors for conveying return air is permitted.

8.16.4.1 **Corridor ceiling.** Use of the space between the corridor ceiling and the floor or roof structure above as a return air plenum is permitted for one or more of the following conditions:

1. The corridor is not required to be of fire-resistance-rated construction;
2. The corridor is separated from the plenum by fire-resistance-rated construction;
3. The air-handling system serving the corridor is shut down upon activation of the air-handling unit smoke detectors required by the SBC 501;
4. The air-handling system serving the corridor is shut down upon detection of sprinkler waterflow where the building is equipped throughout with an automatic sprinkler system; or
5. The space between the corridor ceiling and the floor or roof structure above the corridor is used as a component of an approved engineered smoke control system.

8.16.5 **Corridor continuity.** Fire-resistance-rated corridors shall be continuous from the point of entry to an exit, and shall not be interrupted by intervening rooms.

Exception: Foyers, lobbies or reception rooms constructed as required for corridors shall not be construed as intervening rooms.

SECTION 8.17
EXITS

8.17.1 **General.** Exits shall comply with Sections 8.17 through 8.22 and the applicable requirements of Sections 8.3 through 8.12. An exit shall not be used for any purpose that interferes with its function as a means of egress. Once a given level of exit protection is achieved, such level of protection shall not be reduced until arrival at the exit discharge.

8.17.2 **Exterior exit doors.** Buildings or structures used for human occupancy shall have at least one exterior door that meets the requirements of Section 8.8.1.1.

8.17.2.1 **Detailed requirements.** Exterior exit doors shall comply with the applicable requirements of Section 8.8.1.

8.17.2.2 **Arrangement.** Exterior exit doors shall lead directly to the exit discharge or the public way.

SECTION 8.18
NUMBER OF EXITS AND CONTINUITY

8.18.1 **Minimum number of exits.** All rooms and spaces within each story shall be provided with and have access to the minimum number of approved independent exits as required by Table 8.18.1 based on the occupant load, except as modified in Section 8.14.1 or 8.18.2. For the purposes of this chapter, occupied roofs shall be provided with exits as required for stories. The required number of exits from any story, basement or individual space shall be maintained until arrival at grade or the public way.

TABLE 8.18.1
MINIMUM NUMBER OF EXITS FOR OCCUPANT LOAD

OCCUPANT LOAD	MINIMUM NUMBER OF EXITS
1-500	2
501-1,000	3
More than 1,000	4

8.18.1.1 **Open parking structures.** Parking structures shall not have less than two exits from each parking tier, except that only one exit is required where vehicles are mechanically parked. Unenclosed vehicle ramps shall not be considered as required exits unless pedestrian facilities are provided.

8.18.1.2 **Helistops.** The means of egress from helistops shall comply with the provisions of this chapter, provided that landing areas located on buildings or structures shall have two or more exits. For landing platforms or roof areas less than 18.3 meters long, or less than 186 m^2 in area, the second means of egress is permitted to be a fire escape or ladder leading to the floor below.

8.18.2 **Buildings with one exit.** Only one exit shall be required in buildings as described below:

1. Buildings described in Table 8.18.2, provided that the building has not more than one level below the first story above grade plane.
2. Buildings of Group R-3 occupancy.
3. Single-level buildings with the occupied space at the level of exit discharge

provided that the story or space complies with Section 8.14.1 as a space with one means of egress.

TABLE 8.18.2
BUILDINGS WITH ONE EXIT

OCCUPANCY	MAXIMUM HEIGHT OF BUILDING ABOVE GRADE PLANE	MAXIMUM OCCUPANTS (OR DWELLING UNITS) PER FLOOR AND TRAVEL DISTANCE
A, B[d], E, F, M, U	1 Story	50 occupants and 2.3 meters travel distance
H-2, H-3	1 Story	3 occupants and 7.6 meters travel distance
H-4, H-5, I, R	1 Story	10 occupants and 2.3 meters travel distance
S[a]	1 Story	30 occupants and 30.5 meters travel distance
B[b], F, M, S[a]	2 Stories	30 occupants and 23 meters travel distance
R-2	2 Stories[c]	4 dwelling units and 15 3 meters travel dist.

a. For the required number of exits for open parking structures, see Section 8.18.1.1.
b. For the required number of exits for air traffic control towers, see Section 2.25.1.
c. Buildings classified as Group R-2 equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 and provided with emergency escape and rescue openings in accordance with Section 8.25 shall have a maximum height of three stories above grade, or as agreed by the local municipality.
d. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 with an occupancy in Group B shall have a maximum travel distance of 30.5 meters.

8.18.3 **Exit continuity.** Exits shall be continuous from the point of entry into the exit to the exit discharge.

8.18.4 **Exit door arrangement.** Exit door arrangement shall meet the requirements of Sections 8.14.2 through 8.14.2.2.

SECTION 8.19
VERTICAL EXIT ENCLOSURES

8.19.1 **Enclosures required.** Interior exit stairways and interior exit ramps shall be enclosed with fire barriers. Exit enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the shaft enclosure shall include any basements but not any mezzanines. An exit enclosure shall not be used for any purpose other than means of egress. Enclosures shall be constructed as fire barriers in accordance with Section 4.7 of SBC 801.

Exceptions:

1. In other than Group H and I occupancies, a stairway serving an occupant load of less than 10 not more than one story above the level of exit discharge is not required to be enclosed.
2. Exits in buildings of Group A-5 where all portions of the means of egress are essentially open to the outside need not be enclosed.
3. Stairways serving and contained within a single residential dwelling unit or sleeping unit in occupancies in Group R-2 or R-3 and sleeping units in occupancies in Group R-1 are not required to be enclosed.
4. Stairways that are not a required means of egress element are not required to

be enclosed where such stairways comply with Section 4.8.2 of SBC 801.

5. Stairways in open parking structures which serve only the parking structure are not required to be enclosed.
6. Stairways in occupancies in Group I-3 as provided for in Section 2.21.3.6 are not required to be enclosed.
7. Means of egress stairways as required by Section 2.23.5.4 are not required to be enclosed.
8. In other than occupancy Groups H and I, a maximum of 50 percent of egress stairways serving one adjacent floor are not required to be enclosed, provided at least two means of egress are provided from both floors served by the unenclosed stairways. Any two such interconnected floors shall not be open to other floors.
9. In other than occupancy Groups H and I, interior egress stairways serving only the first and second stories of a building equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801 are not required to be enclosed, provided at least two means of egress are provided from both floors served by the unenclosed stairways. Such interconnected stories shall not be open to other stories.

8.19.1.1 **Openings and penetrations.** Exit enclosure opening protectives shall be in accordance with the requirements of Section 4.15 of SBC 801.

Except as permitted in Section 2.15.4.6, openings in exit enclosures other than unexposed exterior openings shall be limited to those necessary for exit access to the enclosure from normally occupied spaces and for egress from the enclosure.

Where interior exit enclosures are extended to the exterior of a building by an exit passageway, the door assembly from the exit enclosure to the exit passageway shall be protected by a fire door conforming to the requirements in Section 4.16 of SBC 801. Fire door assemblies in exit enclosures shall comply with Section 4.16 of SBC 801.

8.19.1.2 **Penetrations.** Penetrations into and openings through an exit enclosure are prohibited except for required exit doors, equipment and ductwork necessary for independent pressurization, sprinkler piping, standpipes, electrical raceway for fire department communication and electrical raceway serving the exit enclosure and terminating at a steel box not exceeding 0.010 m^2. Such penetrations shall be protected in accordance with Section 4.13 of SBC 801. There shall be no penetrations or communication openings, whether protected or not, between adjacent exit enclosures.

8.19.1.3 **Ventilation.** Equipment and ductwork for exit enclosure ventilation shall comply with one of the following items:

1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the exit enclosure by ductwork enclosed in construction as required for shafts.
2. Where such equipment and ductwork is located within the exit enclosure, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.
3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts.

In each case, openings into the fire-resistance-rated construction shall be limited to those needed for maintenance and operation and shall be protected by self-closing fire-resistance-rated devices in accordance with Chapter 4 of SBC 801 for enclosure wall opening protectives.

Exit enclosure ventilation systems shall be independent of other building ventilation systems.

8.19.1.4 **Vertical enclosure exterior walls.** Exterior walls of a vertical exit enclosure shall comply with the requirements of Section 4.5 of SBC 801 for exterior walls. Where nonrated walls or unprotected openings enclose the exterior of the stairway and the walls or openings are exposed by other parts of the building at an angle of less than 180 degrees, the building exterior walls within 3.0 meters horizontally of a nonrated wall or unprotected opening shall be constructed as required for a minimum 1 hour fire-resistance rating with 3/4-hour opening protectives. This construction shall extend vertically from the ground to a point 3.0 meters above the topmost landing of the stairway or to the roof line, whichever is lower.

8.19.1.5 **Enclosures under stairways.** The walls and soffits within enclosed usable spaces under enclosed and unenclosed stairways shall be protected by 1 hour fire-resistance-rated construction, or the fire-resistance rating of the stairway enclosure, whichever is greater. Access to the enclosed usable space shall not be directly from within the stair enclosure.

Exception: Spaces under stairways serving and contained within a single residential dwelling unit in Group R-2 or R-3 as applicable in SBC 100.

There shall be no enclosed usable space under exterior exit stairways unless the space is completely enclosed in 1 hour fire-resistance-rated construction. The open space under exterior stairways shall not be used for any purpose.

8.19.1.6 **Discharge identification.** A stairway in an exit enclosure shall not continue below the level of exit discharge unless an approved barrier is provided at the level of exit discharge to prevent persons from unintentionally continuing into levels below. Directional exit signs shall be provided as specified in Section 8.11.

8.19.1.7 **Stairway floor number signs.** A sign shall be provided at each floor landing in interior vertical exit enclosures connecting more than three stories designating the floor level, the terminus of the top and bottom of the stair enclosure and the identification of the stair. The signage shall also state the story of, and the direction to the exit discharge and the availability of roof access from the stairway for the fire department. The sign shall be located 1.5 meters above the floor landing in a position which is readily visible when the doors are in the open and closed positions.

8.19.1.8 **Smokeproof enclosures.** In buildings required to comply with Section 2.16 or 2.17 each of the exits of a building that serves stories where the floor surface is located more than 23.0 meters above the lowest level of fire department vehicle access or more than 9.2 meters below the level of exit discharge serving such floor levels shall be a smokeproof enclosure or pressurized stairway in accordance with Section 7.9 of SBC 801.

8.19.1.8.1 **Enclosure exit.** A smokeproof enclosure or pressurized stairway shall exit into a public way or into an exit passageway, yard or open space having direct access to a public way. The exit passageway shall be without other openings and shall be separated from the remainder of the building by 2-hour fire-resistance-rated construction.

Exceptions:

1. Openings in the exit passageway serving a smokeproof enclosure are permitted where the exit passageway is protected and pressurized in the same manner as the smokeproof enclosure, and openings are protected as required for access from other floors.
2. Openings in the exit passageway serving a pressurized stairway are permitted where the exit passageway is protected and pressurized in the same manner as the pressurized stairway.

8.19.1.8.2 **Enclosure access.** Access to the stairway within a smokeproof enclosure shall be by way of a vestibule or an open exterior balcony.

Exception: Access is not required by way of a vestibule or exterior balcony for stairways using the pressurization alternative complying with Section 7.9.20 of BSC 801.

SECTION 8.20
EXIT PASSAGEWAYS

8.20.1 **Exit passageway.** Exit passageways serving as an exit component in a means of egress system shall comply with the requirements of this section. An exit passageway shall not be used for any purpose other than as a means of egress.

8.20.2 **Width.** The width of exit passageways shall be determined as specified in Section 8.5.1 but such width shall not be less than 1.1 meters, except that exit passageways serving an occupant load of less than 50 shall not be less than 900 mm in width.

The required width of exit passageways shall be unobstructed.

Exception: Doors, when fully opened, and handrails, shall not reduce the required width by more than 180 mm. Doors in any position shall not reduce the required width by more than one-half. Other nonstructural projections such as trim and similar decorative features are permitted to project into the required width 38 mm on each side.

8.20.3 **Construction.** Exit passageway enclosures shall have walls, floors and ceilings of not less than 1 hour fire-resistance rating, and not less than that required for any connecting exit enclosure. Exit passageways shall be constructed as fire barriers in accordance with Section 4.9 of SBC 801.

8.20.4 **Openings and penetrations.** Exit passageway opening protectives shall be in accordance with the requirements of Section 4.16 of SBC 801.

Except as permitted in Section 2.15.4.6, openings in exit passageways other than unexposed exterior openings shall be limited to those necessary for exit access to the exit passageway from normally occupied spaces and for egress from the exit passageway.

Where interior exit enclosures are extended to the exterior of a building by an exit passageway, the door assembly from the exit enclosure to the exit passageway shall be protected by a fire door conforming to the requirements in Section 4.16 of SBC 801. Fire door assemblies in exit passageways shall comply with Section 4.16 of SBC 801.

Elevators shall not open into an exit passageway.

8.20.5 **Penetrations.** Penetrations into and openings through an exit passageway are prohibited except for required exit doors, equipment and ductwork necessary for independent pressurization, sprinkler piping, standpipes, electrical raceway for fire department communication and electrical raceway serving the exit passageway and terminating at a steel box not exceeding 0.010 m^2. Such penetrations shall be protected in accordance with Section 4.13 of SBC 801. There shall be no penetrations or communicating openings, whether protected or not, between adjacent exit passageways.

SECTION 8.21
HORIZONTAL EXITS

8.21.1 **Horizontal exits.** Horizontal exits serving as an exit in a means of egress system

shall comply with the requirements of this section. A horizontal exit shall not serve as the only exit from a portion of a building, and where two or more exits are required, not more than one-half of the total number of exits or total exit width shall be horizontal exits.

Exceptions:

1. Horizontal exits are permitted to comprise two-thirds of the required exits from any building or floor area for occupancies in Group I-2.
2. Horizontal exits are permitted to comprise 100 percent of the exits required for occupancies in Group I-3. At least 0.6 m^2 of accessible space per occupant shall be provided on each side of the horizontal exit for the total number of people in adjoining compartments.

Every fire compartment for which credit is allowed in connection with a horizontal exit shall not be required to have a stairway or door leading directly outside, provided the adjoining fire compartments have stairways or doors leading directly outside and are so arranged that egress shall not require the occupants to return through the compartment from which egress originates.

The area into which a horizontal exit leads shall be provided with exits adequate to meet the occupant requirements of this chapter, but not including the added occupant capacity imposed by persons entering it through horizontal exits from another area. At least one of its exits shall lead directly to the exterior or to an exit enclosure.

8.21.2 **Separation.** The separation between buildings or areas of refuge connected by a horizontal exit shall be provided by a fire wall complying with Section 4B.5 of SBC 801 or a fire barrier complying with Section 4B.6 of SBC 801 and having a fire-resistance rating of not less than 2 hours. Opening protectives in horizontal exit walls shall also comply with Section 4B.15 of SBC 801. The horizontal exit separation shall extend vertically through all levels of the building unless floor assemblies are of 2 hours fire resistance with no unprotected openings.

Exception: A fire-resistance rating is not required at horizontal exits between a building area and an above-grade pedestrian walkway constructed in accordance with Section 4.4.4, provided that the distance between connected buildings is more than 6100 mm (about 20 feet).

Horizontal exit walls constructed as fire barriers shall be continuous from exterior wall to exterior wall so as to divide completely the floor served by the horizontal exit.

8.21.3 **Opening protectives.** Fire doors in horizontal exits shall be self-closing or automatic-closing when activated by a smoke detector installed in accordance with Section 7.7.11 of BSC 801. Opening protectives in horizontal exits shall be consistent with the fire-resistance rating of the wall. Such doors where located in a cross-corridor condition shall be automatic-closing by activation of a smoke detector installed in accordance with Section 7.7.11 of BSC 801.

8.21.4 **Capacity of refuge area.** The refuge area of a horizontal exit shall be spaces occupied by the same tenant or public areas and each such area of refuge shall be adequate to house the original occupant load of the refuge space plus the occupant load anticipated from the adjoining compartment. The anticipated occupant load from the adjoining compartment shall be based on the capacity of the horizontal exit doors entering the area of refuge. The capacity of areas of refuge shall be computed on a net floor area allowance of 0.28 m^2 for each occupant to be accommodated therein, not including areas of stairways, elevators and other shafts or courts.

Exception: The net floor area allowable per occupant shall be as follows for the

indicated occupancies:

1. 0.6 m^2 per occupant for occupancies in Group I-3.
2. 1.4 m^2 per occupant for ambulatory occupancies in Group I-2.
3. 2.8 m^2 per occupant for non-ambulatory occupancies in Group I-2.

SECTION 8.22
EXTERIOR EXIT RAMPS AND STAIRWAYS

8.22.1 **Exterior exit ramps and stairways.** Exterior exit ramps and stairways serving as an element of a required means of egress shall comply with this section.

Exception: Exterior exit ramps and stairways for outdoor stadiums complying with Section 8.19.1, Exception 2.

8.22.2 **Use in a means of egress.** Exterior exit ramps and stairways shall not be used as an element of a required means of egress for occupancies in Group I-2. For occupancies in other than Group I-2, exterior exit ramps and stairways shall be permitted as an element of a required means of egress for buildings not exceeding six stories or 23.0 meters in height.

8.22.3 **Open side.** Exterior exit ramps and stairways serving as an element of a required means of egress shall be open on at least one side. An open side shall have a minimum of 3.3 m^2 of aggregate open area adjacent to each floor level and the level of each intermediate landing. The required open area shall be located not less than 1.1 meters above the adjacent floor or landing level.

8.22.4 **Side yards.** The open areas adjoining exterior exit ramps or stairways shall be either yards, courts or public ways; the remaining sides are permitted to be enclosed by the exterior walls of the building.

8.22.5 **Location.** Exterior exit ramps and stairways shall be located in accordance with Section 8.23.3.

8.22.6 **Exterior ramps and stairway protection.** Exterior exit ramps and stairways shall be separated from the interior of the building as required in Section 8.19.1. Openings shall be limited to those necessary for egress from normally occupied spaces.

Exceptions:

1. Separation from the interior of the building is not required for occupancies, other than those in Group R-1 or R-2, in buildings that are no more than two stories above grade where the level of exit discharge is the first story above grade.
2. Separation from the interior of the building is not required where the exterior ramp or stairway is served by an exterior ramp and/or balcony that connects two remote exterior stairways or other approved exits, with a perimeter that is not less than 50 percent open. To be considered open, the opening shall be a minimum of 50 percent of the height of the enclosing wall, with the top of the openings no less than 2.2 meters above the top of the balcony.
3. Separation from the interior of the building is not required for an exterior ramp or stairway located in a building or structure that is permitted to have unenclosed interior stairways in accordance with Section 8.19.1.
4. Separation from the interior of the building is not required for exterior ramps or stairways connected to open-ended corridors, provided that Items 4.1

through 4.4 are met:

4.1 The building, including corridors and ramps and/or stairs, shall be equipped throughout with an automatic sprinkler system in accordance with Section 7.3 of SBC 801.

4.2 The open-ended corridors comply with Section 8.16.

4.3 The open-ended corridors are connected on each end to an exterior exit ramp or stairway complying with Section 8.22.

4.4 At any location in an open-ended corridor where a change of direction exceeding 45 degrees occurs, a clear opening of not less than 3.3 m^2 or an exterior ramp or stairway shall be provided. Where clear openings are provided, they shall be located so as to minimize the accumulation of smoke or toxic gases.

SECTION 8.23
EXIT DISCHARGE

8.23.1 **General.** Exits shall discharge directly to the exterior of the building. The exit discharge shall be at grade or shall provide direct access to grade. The exit discharge shall not reenter a building.

Exceptions:

1. A maximum of 50 percent of the number and capacity of the exit enclosures is permitted to egress through areas on the level of discharge provided all of the following are met:

1.1 Such exit enclosures egress to a free and unobstructed way to the exterior of the building, which way is readily visible and identifiable from the point of termination of the exit enclosure.

1.2 The entire area of the level of discharge is separated from areas below by construction conforming to the fire-resistance rating for the exit enclosure.

1.3 The egress path from the exit enclosure on the level of discharge is protected throughout by an approved automatic sprinkler system. All portions of the level of discharge with access to the egress path shall either be protected throughout with an automatic sprinkler system installed in accordance with Section 7.3 of SBC 801 or separated from the egress path in accordance with the requirements for the enclosure of exits.

2. A maximum of 50 percent of the number and capacity of the exit enclosures is permitted to egress through a vestibule provided all of the following are met:

2.1 The entire area of the vestibule is separated from areas below by construction conforming to the fire-resistance rating for the exit enclosure.

2.2 The depth from the exterior of the building is not greater than 3.0 meters and the length is not greater than 9.2 meters.

2.3 The area is separated from the remainder of the level of exit discharge by construction providing protection at least the equivalent of approved wired glass in steel frames.

2.4 The area is used only for means of egress and exits directly to the outside.

3. Stairways in open parking garages complying with Section 8.19.1, Exception 5, are permitted to egress through the open parking garage at the level of exit discharge.

8.23.2 **Exit discharge capacity.** The capacity of the exit discharge shall be not less than the required discharge capacity of the exits being served.

8.23.3 **Exit discharge location.** Exterior balconies, stairways and ramps shall be located at least 3.0 meters from adjacent lot lines and from other buildings on the same lot unless the adjacent building exterior walls and openings are protected in accordance with Section 4.5 of SBC 801 based on fire separation distance.

8.23.4 **Exit discharge components.** Exit discharge components shall be sufficiently open to the exterior so as to minimize the accumulation of smoke and toxic gases.

8.23.5 **Egress courts.** Egress courts serving as a portion of the exit discharge in the means of egress system shall comply with the requirements of Section 8.23.

8.23.5.1 **Width.** The width of egress courts shall be determined as specified in Section 8.5.1, but such width shall not be less than 1.1 meters, except as specified herein. Egress courts serving occupancies in Group R-3 applicable in SBC 100 and Group U shall not be less than 900 mm in width.

The required width of egress courts shall be unobstructed to a height of 2.2 meters.

Exception: Doors, when fully opened and handrails shall not reduce the required width by more than 180 mm. Doors in any position shall not reduce the required width by more than one-half. Other nonstructural projections such as trim and similar decorative features are permitted to project into the required width 38 mm from each side.

Where an egress court exceeds the minimum required width and the width of such egress court is then reduced along the path of exit travel, the reduction in width shall be gradual. The transition in width shall be affected by a guard not less than 900 mm in height and shall not create an angle of more than 30 degrees with respect to the axis of the egress court along the path of egress travel. In no case shall the width of the egress court be less than the required minimum.

8.23.5.2 **Construction and openings.** Where an egress court serving a building or portion thereof is less than 3.0 meters in width, the egress court walls shall be not less than 1 hour fire-resistance-rated exterior walls complying with Section 4.5 of SBC 801 for a distance of 3.0 meters above the floor of the court, and openings therein shall be equipped with fixed or self-closing, 3/4-hour opening protective assemblies.

Exceptions:

1. Egress courts serving an occupant load of less than 10.
2. Egress courts serving Group R-3 as applicable in SBC 100.

8.23.6 **Access to a public way.** The exit discharge shall provide a direct and unobstructed access to a public way.

Exception: Where access to a public way cannot be provided, a safe dispersal area shall be provided where all of the following are met:

1. The area shall be of a size to accommodate at least 0.28 m^2 for each person.
2. The area shall be located on the same property at least 15.3 meters away from the building requiring egress.
3. The area shall be permanently maintained and identified as a safe dispersal area.
4. The area shall be provided with a safe and unobstructed path of travel from the building.

SECTION 8.24
ASSEMBLY

8.24.1 **General.** Occupancies in Group A which contain seats, tables, displays, equipment or other material shall comply with this section.

8.24.1.1 **Bleachers.** Bleachers, grandstands, and folding and telescopic seating shall comply with ICC 300.

8.24.2 **Assembly main exit.** Group A occupancies that have an occupant load of greater than 300 shall be provided with a main exit. The main exit shall be of sufficient width to accommodate not less than one-half of the occupant load, but such width shall not be less than the total required width of all means of egress leading to the exit. Where the building is classified as a Group A occupancy, the main exit shall front on at least one street or an unoccupied space of not less than 3.0 meters in width that adjoins a street or public way.

Exception: In assembly occupancies where there is no well-defined main exit or where multiple main exits are provided, exits shall be permitted to be distributed around the perimeter of the building provided that the total width of egress is not less than 100 percent of the required width.

8.24.3 **Assembly other exits.** In addition to having access to a main exit, each level of an occupancy in Group A having an occupant load of greater than 300 shall be provided with additional exits that shall provide an egress capacity for at least one-half of the total occupant load served by that level and comply with Section 8.14.2.

Exception: In assembly occupancies where there is no well-defined main exit or where multiple main exits are provided, exits shall be permitted to be distributed around the perimeter of the building provided that the total width of egress is not less than 100 percent of the required width.

8.24.4 **Foyers and lobbies.** In Group A-1 occupancies, where persons are admitted to the building at times when seats are not available and are allowed to wait in a lobby or similar space, such use of lobby or similar space shall not encroach upon the required clear width of the means of egress. Such waiting areas shall be separated from the required means of egress by substantial permanent partitions or by fixed rigid railings not less than 1.1 meters high. Such foyer, if not directly connected to a public street by all the main entrances or exits, shall have a straight and unobstructed corridor or path of travel to every such main entrance or exit.

8.24.5 **Interior balcony and gallery means of egress.** For balconies or galleries having a seating capacity of over 50 located in Group A occupancies, at least two means of egress shall be provided, one from each side of every balcony or gallery, with at least one leading directly to an exit.

8.24.5.1 **Enclosure of balcony openings.** Interior stairways and other vertical openings shall be enclosed in a vertical exit enclosure as provided in Section 8.19.1, except that stairways are permitted to be open between the balcony and the main assembly floor in occupancies such as theaters, mosques and auditoriums. At least one accessible means of egress is required from a balcony or gallery level containing accessible seating locations in accordance with Section 8.7.3 or 8.7.4.

8.24.6 **Width of means of egress for assembly.** The clear width of aisles and other means of egress shall comply with Section 8.24.6.1 where smoke-protected seating is not provided and with Section 8.24.6.2 or 8.24.6.3 where smoke-protected

seating is provided. The clear width shall be measured to walls, edges of seating and tread edges except for permitted projections.

8.24.6.1 **Without smoke protection.** The clear width of the means of egress shall provide sufficient capacity in accordance with all of the following, as applicable:

1. At least 7.6 mm of width for each occupant served shall be provided on stairs having riser heights 180 mm or less and tread depths 280 mm or greater, measured horizontally between tread nosing.
2. At least 0.127 mm of additional stair width for each occupant shall be provided for each 2.5 mm of riser height above 180 mm.
3. Where egress requires stair descent, at least 1.9 mm of additional width for each occupant shall be provided on those portions of stair width having no handrail within a horizontal distance of 750 mm.
4. Ramped means of egress, where slopes are steeper than one unit vertical in 12 units horizontal (8 percent slope), shall have at least 5.6 mm of clear width for each occupant served. Level or ramped means of egress, where slopes are not steeper than one unit vertical in 12 units horizontal (8 percent slope), shall have at least 5.1 mm of clear width for each occupant served.

8.24.6.2 **Smoke-protected seating.** The clear width of the means of egress for smoke-protected assembly seating shall be not less than the occupant load served by the egress element multiplied by the appropriate factor in Table 8.24.6.2. The total number of seats specified shall be those within a single assembly space and exposed to the same smoke-protected environment. Interpolation is permitted between the specific values shown. A life safety evaluation, complying with NFPA 101, shall be done for a facility utilizing the reduced width requirements of Table 8.24.6.2 for smoke-protected assembly seating.

Exception: For an outdoor smoke-protected assembly with an occupant load not greater than 18,000, the clear width shall be determined using the factors in Section 8.24.6.3.

TABLE 8.24.6.2
WIDTH OF AISLES FOR SMOKE-PROTECTED ASSEMBLY

TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY OCCUPANCY	mm OF CLEAR WIDTH PER SEAT SERVED			
	Stairs and aisle steps with handrails within 760 mm (30 inches)	Stairs and aisle steps without handrails within 760 mm (30 inches)	Passageways, doorways and ramps not steeper than 1 in 10 in slope	Ramps steeper than 1 in 10 in slope
Equal to or less than 5,000	5.08	6.35	3.81	4.19
10,000	3.3	4.14	2.54	2.79
15,000	2.44	3.05	1.78	1.96
20,000	1.93	2.44	1.42	1.57
Equal to or greater than 25,000	1.52	1.91	1.12	1.22

8.24.6.2.1 **Smoke control.** Means of egress serving a smoke-protected assembly seating area shall be provided with a smoke control system complying with Section 7.9 of SBC 801 or natural ventilation designed to maintain the smoke level at least 1.8 meters above the floor of the means of egress.

8.24.6.2.2 **Roof height.** A smoke-protected assembly seating area with a roof shall have the lowest portion of the roof deck not less than 4.6 meters above the highest aisle or aisle accessway.

Exception: A roof canopy in an outdoor stadium shall be permitted to be less than 4.6 meters above the highest aisle or aisle accessway provided that there are no objects less than 2.1 meters above the highest aisle or aisle accessway.

8.24.6.2.3 **Automatic sprinklers.** Enclosed areas with walls and ceilings in buildings or structures containing smoke-protected assembly seating shall be protected with an approved automatic sprinkler system in accordance with Section 7.3 of SBC 801.

Exceptions:

1. The floor area used for contests, performances or entertainment provided the roof construction is more than 1.5 meters above the floor level and the use is restricted to low fire hazard uses.
2. Press boxes and storage facilities less than 93 m^2 in area.
3. Outdoor seating facilities where seating and the means of egress in the seating area are essentially open to the outside.

8.24.6.3 **Width of means of egress for outdoor smoke-protected assembly.** The clear width in mm of aisles and other means of egress shall be not less than the total occupant load served by the egress element multiplied by 2.0 where egress is by aisles and stairs and multiplied by 1.52 mm where egress is by ramps, corridors, tunnels or vomitories.

Exception: The clear width in mm of aisles and other means of egress shall be permitted to comply with Section 8.24.6.2 for the number of seats in the outdoor smoke-protected assembly where Section 8.24.6.2 permits less width.

8.24.7 **Travel distance.** Exits and aisles shall be so located that the travel distance to an exit door shall not be greater than 61.0 meters measured along the line of travel in nonsprinklered buildings. Travel distance shall not be more than 76.0 meters in sprinklered buildings. Where aisles are provided for seating, the distance shall be measured along the aisles and aisle accessway without travel over or on the seats.

Exceptions:

1. Smoke-protected assembly seating: The travel distance from each seat to the nearest entrance to a vomitory or concourse shall not exceed 61.0 meters. The travel distance from the entrance to the vomitory or concourse to a stair, ramp or walk on the exterior of the building shall not exceed 61.0 meters.
2. Open-air seating: The travel distance from each seat to the building exterior shall not exceed 122.0 meters. The travel distance shall not be limited in facilities of Type I or II construction.

8.24.8 **Common path of travel.** The common path of travel shall not exceed 9.2 meters from any seat to a point where a person has a choice of two paths of egress travel to two exits.

Exceptions:

1. For areas serving not more than 50 occupants, the common path of travel shall not exceed 23.0 meters.
2. For smoke-protected assembly seating, the common path of travel shall not exceed 15.3 meters.

8.24.8.1 **Path through adjacent row.** Where one of the two paths of travel is across the aisle through a row of seats to another aisle, there shall be not more than 24 seats between the two aisles, and the minimum clear width between rows for the row between the two aisles shall be 300 mm plus 15.2 mm for each additional seat above seven in the row between aisles.

Exception: For smoke-protected assembly seating there shall not be more than 40 seats between the two aisles and the minimum clear width shall be 300 mm plus 7.6 mm for each additional seat.

8.24.9 **Assembly aisles are required.** Every occupied portion of any occupancy in Group A that contains seats, tables, displays, similar fixtures or equipment shall be provided with aisles leading to exits or exit access doorways in accordance with this section. Aisle accessways for tables and seating shall comply with Section 8.13.4.2.

8.24.9.1 **Minimum aisle width.** The minimum clear width of aisles shall be as shown:

1. 1.2 meters for aisle stairs having seating on each side.
   Exception: 900 mm where the aisle does not serve more than 50 seats.
2. 900 mm for aisle stairs having seating on only one side.
3. 585 mm between an aisle stair handrail or guard and seating where the aisle is subdivided by a handrail.
4. 1.1 meters for level or ramped aisles having seating on both sides.
   Exceptions:
   1. 900 mm where the aisle does not serve more than 50 seats.
   2. 760 mm where the aisle does not serve more than 14 seats.
5. 900 mm for level or ramped aisles having seating on only one side.
   Exception: 760 mm where the aisle does not serve more than 14 seats.
6. 585 mm between an aisle stair handrail and seating where an aisle does not serve more than five rows on one side.

8.24.9.2 **Aisle width.** The aisle width shall provide sufficient egress capacity for the number of persons accommodated by the catchment area served by the aisle. The catchment area served by an aisle is that portion of the total space that is served by that section of the aisle. In establishing catchment areas, the assumption shall be made that there is a balanced use of all means of egress, with the number of persons in proportion to egress capacity.

8.24.9.3 **Converging aisles.** Where aisles converge to form a single path of egress travel, the required egress capacity of that path shall not be less than the combined required capacity of the converging aisles.

8.24.9.4 **Uniform width.** Those portions of aisles, where egress is possible in either of two directions, shall be uniform in required width.

8.24.9.5 **Assembly aisle termination.** Each end of an aisle shall terminate at cross aisle, foyer, doorway, vomitory or concourse having access to an exit.

Exceptions:

1. Dead-end aisles shall not be greater than 6.1 meters in length.
2. Dead-end aisles longer than 6.1 meters are permitted where seats beyond the 6.1 meters dead-end aisle are no more than 24 seats from another aisle, measured along a row of seats having a minimum clear width of 300 mm plus 15.2 mm for each additional seat above seven in the row.
3. For smoke-protected assembly seating, the dead-end aisle length of vertical aisles shall not exceed a distance of 21 rows.
4. For smoke-protected assembly seating, a longer dead-end aisle is permitted where seats beyond the 21-row dead-end aisle are not more than 40 seats from another aisle, measured along a row of seats having an aisle accessway with a minimum clear width of 300 mm plus 7.6 mm for each additional seat above seven in the row.

8.24.9.6 **Assembly aisle obstructions.** There shall be no obstructions in the required width of aisles except for handrails as provided in Section 8.24.13.

8.24.10 **Clear width of aisle accessways serving seating.** Where seating rows have 14 or fewer seats, the minimum clear aisle accessway width shall not be less than 300 mm measured as the clear horizontal distance from the back of the row ahead and

the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic or self-rising seat, the measurements shall be made with the seat in the down position. For seats with folding tablet arms, row spacing shall be determined with the tablet arm down.

8.24.10.1 **Dual access.** For rows of seating served by aisles or doorways at both ends, there shall not be more than 100 seats per row. The minimum clear width of 300 mm between rows shall be increased by 7.6 mm for every additional seat beyond 14 seats, but the minimum clear width is not required to exceed 560 mm.

Exception: For smoke-protected assembly seating, the row length limits for a 300 mm-wide aisle accessway, beyond which the aisle accessway minimum clear width shall be increased.

8.24.10.2 **Single access.** For rows of seating served by an aisle or doorway at only one end of the row, the minimum clear width of 300 mm between rows shall be increased by 15.2 mm for every additional seat beyond seven seats, but the minimum clear width is not required to exceed 560 mm.

Exception: For smoke-protected assembly seating, the row length limits for a 300 mm-wide aisle accessway, beyond which the aisle accessway minimum clear width shall be increased, are in Table 8.24.10.1.

TABLE 8.24.10.1
SMOKE-PROTECTED ASSEMBLY AISLE ACCESSWAYS

TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY OCCUPANCY	MAXIMUM NUMBER OF SEATS PER ROW PERMITTED TO HAVE A MINIMUM 300 mm CLEAR WIDTH AISLE ACCESSWAY	
	Aisle or doorway at both ends of row	Aisle or doorway at one end of row only
Less than 4,000	14	7
4,000	15	7
7,000	16	8
10,000	17	8
13,000	18	9
16,0000	19	9
19,000	20	10
22,000 and greater	21	11

8.24.11 **Assembly aisle walking surfaces.** Aisles with a slope not exceeding one unit vertical in eight units horizontal 12.5 percent slope) shall consist of a ramp having a slip-resistant walking surface. Aisles with a slope exceeding one unit vertical in eight units horizontal (12.5 percent slope) shall consist of a series of risers and treads that extends across the full width of aisles and complies with Sections 8.24.11.1 through 8.24.11.3.

8.24.11.1 **Treads.** Tread depths shall be a minimum of 280 mm and shall have dimensional uniformity.

Exception: The tolerance between adjacent treads shall not exceed 4.8 mm.

8.24.11.2 **Risers.** Where the gradient of aisle stairs is to be the same as the gradient of adjoining seating areas, the riser height shall not be less than 100 mm nor more than 200 mm and shall be uniform within each flight.

Exceptions:

1. Riser height non-uniformity shall be limited to the extent necessitated by changes in the gradient of the adjoining seating area to maintain adequate sightlines. Where non-uniformities exceed 4.8 mm between adjacent risers, the exact location of such non-uniformities shall be indicated with a distinctive marking stripe on each tread at the nosing or leading edge adjacent to the non-uniform risers. Such stripe shall be a minimum of 25 mm and a maximum of 50 mm, wide. The edge marking stripe shall be distinctively different from the contrasting marking stripe.
2. Riser heights not exceeding 230 mm shall be permitted where they are necessitated by the slope of the adjacent seating areas to maintain sightlines.

8.24.11.3 **Tread contrasting marking stripe.** A contrasting marking stripe shall be provided on each tread at the nosing or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be a minimum of 25 mm, and a maximum of 50 mm, wide.

Exception: The contrasting marking stripe is permitted to be omitted where tread surfaces are such that the location of each tread is readily apparent when viewed in descent.

8.24.12 **Seat stability.** In places of assembly, the seats shall be securely fastened to the floor.

Exceptions:

1. In places of assembly or portions thereof without ramped or tiered floors for seating and with 200 or fewer seats, the seats shall not be required to be fastened to the floor.
2. In places of assembly or portions thereof with seating at tables and without ramped or tiered floors for seating, the seats shall not be required to be fastened to the floor.
3. In places of assembly or portions thereof without ramped or tiered floors for seating and with greater than 200 seats, the seats shall be fastened together in groups of not less than three or the seats shall be securely fastened to the floor.
4. In places of assembly where flexibility of the seating arrangement is an integral part of the design and function of the space and seating is on tiered levels, a maximum of 200 seats shall not be required to be fastened to the floor. Plans showing seating, tiers and aisles shall be submitted for approval.
5. Groups of seats within a place of assembly separated from other seating by railings, guards, partial height walls or similar barriers with level floors and having no more than 14 seats per group shall not be required to be fastened to the floor.
6. Seats intended for musicians or other performers and separated by railings, guards, partial height walls or similar barriers shall not be required to be fastened to the floor.

8.24.13 **Handrails.** Ramped aisles having a slope exceeding 1 unit vertical in 15 units horizontal (7 percent slope) and aisle stairs shall be provided with handrails located either at the side or within the aisle width.

Exceptions:

1. Handrails are not required for ramped aisles having a gradient no greater than 1 unit vertical in 8 units horizontal (12.5 percent slope) and seating on both sides.
2. Handrails are not required if, at the side of the aisle, there is a guard that complies with the graspability requirements of handrails.

8.24.13.1 **Discontinuous handrails.** Where there is seating on both sides of the aisle, the handrails shall be discontinuous with gaps or breaks at intervals not exceeding five rows to facilitate access to seating and to permit crossing from one side of the aisle to the other. These gaps or breaks shall have a clear width of at least 560 mm and not greater than 900 mm, measured horizontally, and the handrail shall have rounded terminations or bends.

8.24.13.2 **Intermediate handrails.** Where handrails are provided in the middle of aisle stairs, there shall be an additional intermediate handrail located approximately 300 mm below the main handrail.

8.24.14 **Assembly guards.** Assembly guards shall comply with Sections 8.24.14.1 through 8.24.14.3.

8.24.14.1 **Cross aisles.** Cross aisles located more than 750 mm above the floor or grade below shall have guards in accordance with Section 8.12.

Where an elevation change of 750 mm or less occurs between a cross aisle and the adjacent floor or grade below, guards not less than 660 mm above the aisle floor shall be provided.

Exception: Where the backs of seats on the front of the cross aisle project 600 mm or more above the adjacent floor of the aisle, a guard need not be provided.

8.24.14.2 **Sightline-constrained guard heights.** Unless subject to the requirements of Section 8.24.14.3, a fascia or railing system in accordance with the guard requirements of Section 8.12 and having a minimum height of 660 mm shall be provided where the floor or footboard elevation is more than 750 mm above the floor or grade below and the fascia or railing would otherwise interfere with the sightlines of immediately adjacent seating. At bleachers, a guard must be provided where the floor or footboard elevation is more than 600 mm above the floor or grade below and the fascia or railing would otherwise interfere with the sightlines of the immediately adjacent seating.

8.24.14.3 **Guards at the end of aisles.** A fascia or railing system complying with the guard requirements of Section 8.12 shall be provided for the full width of the aisle where the foot of the aisle is more than 750 mm above the floor or grade below. The fascia or railing shall be a minimum of 900 mm high and shall provide a minimum 1070 mm measured diagonally between the top of the rail and the nosing of the nearest tread.

8.24.15 **Bench seating.** Where bench seating is used, the number of persons shall be based on one person for each 450 mm of length of the bench.

SECTION 8.25
EMERGENCY ESCAPE AND RESCUE

8.25.1 **General.** In addition to the means of egress required by this chapter, provisions shall be made for emergency escape and rescue in Group R as applicable in SBC 100 and Group I-1 occupancies. Basements and sleeping rooms below the fourth story above grade plane shall have at least one exterior emergency escape and rescue opening in accordance with this section. Where basements contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room, but shall not be required in adjoining areas of the basement. Such opening shall open directly into a public street, public alley, yard or court.

Exceptions:

1. In other than Group R-3 occupancies as applicable in SBC 100 buildings equipped throughout with an approved automatic sprinkler system in

accordance with Section 7.3 of SBC 801.

2. In other than Group R-3 occupancies as applicable in SBC 100 sleeping rooms provided with a door to a fire-resistance-rated corridor having access to two remote exits in opposite directions.
3. The emergency escape and rescue opening is permitted to open onto a balcony within an atrium in accordance with the requirements of Section 2.17 provided the balcony provides access to an exit and the dwelling unit or sleeping unit has a means of egress that is not open to the atrium.
4. Basements with a ceiling height of less than 2.1 meters shall not be required to have emergency escape and rescue windows.
5. High-rise buildings in accordance with Section 2.16.
6. Emergency escape and rescue openings are not required from basements or sleeping rooms which have an exit door or exit access door that opens directly into a public street, public alley, yard, egress court or to an exterior exit balcony that opens to a public street, public alley, yard or egress court.
7. Basements without habitable spaces and having no more than 18.6 m^2 in floor area shall not be required to have emergency escape windows.

8.25.2 **Minimum size.** Emergency escape and rescue openings shall have a minimum net clear opening of 0.53 m^2.

Exception: The minimum net clear opening for emergency escape and rescue grade-floor openings shall be 0.46 m^2.

8.25.2.1 **Minimum dimensions.** The minimum net clear opening height dimension shall be 600 mm. The minimum net clear opening width dimension shall be 510 mm. The net clear opening dimensions shall be the result of normal operation of the opening.

8.25.3 **Maximum height from floor.** Emergency escape and rescue openings shall have the bottom of the clear opening not greater than 1.1 meters measured from the floor.

8.25.4 **Operational constraints.** Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Bars, grilles, grates or similar devices are permitted to be placed over emergency escape and rescue openings provided the minimum net clear opening size complies with Section 8.25.2 and such devices shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required for normal operation of the escape and rescue opening. Where such bars, grilles, grates or similar devices are installed in existing buildings, smoke alarms shall be installed in accordance with Section 7.7 of SBC 801 regardless of the valuation of the alteration.

8.25.5 **Window wells.** An emergency escape and rescue opening with a finished sill height below the adjacent ground level shall be provided with a window well in accordance with Sections 8.25.5.1 and 8.25.5.2.

8.25.5.1 **Minimum size.** The minimum horizontal area of the window well shall be 0.84 m^2, with a minimum dimension of 900 mm. The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

8.25.5.2 **Ladders or steps.** Window wells with a vertical depth of more than 1.1 meters shall be equipped with an approved permanently affixed ladder or steps. Ladders or rungs shall have an inside width of at least 300 mm, shall project at least 75 mm from the wall and shall be spaced not more than 450 mm on center (o.c.) vertically

for the full height of the window well. The ladder or steps shall not encroach into the required dimensions of the window well by more than 150 mm. The ladder or steps shall not be obstructed by the emergency escape and rescue opening. Ladders or steps required by this section are exempt from the stairway requirements of Section 8.9.

CHAPTER 9
ACCESSIBILITY

SECTION 9.1
GENERAL

9.1.1 **Scope.** The provisions of this chapter shall control the design and construction of facilities for accessibility to physically disabled persons.

9.1.2 **Design.** Buildings and facilities shall be designed and constructed to be accessible in accordance with this code requirements and ICC A117.1.

SECTION 9.2
DEFINITIONS

9.2.1 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in the code, have the following meanings:

ACCESSIBLE. A site, building, facility or portion thereof, that complies with this chapter.

ACCESSIBLE ROUTE. A continuous, unobstructed path that complies with this chapter.

ACCESSIBLE UNIT. A dwelling unit or sleeping unit that complies with this code requirements and Chapters 1 through 9 of ICC A117.1.

CIRCULATION PATH. An exterior or interior way of passage from one place to another for pedestrians.

COMMON USE. Interior or exterior circulation paths, rooms, spaces or elements that are not for public use and are made available for the shared use of two or more people.

DETECTABLE WARNING. A standardized surface feature built in or applied to walking surfaces or other elements to warn visually impaired persons of hazards on a circulation path.

DWELLING UNIT OR SLEEPING UNIT, MULTISTORY. A dwelling unit or sleeping unit with habitable space located on more than one story.

DWELLING UNIT OR SLEEPING UNIT, TYPE A. A dwelling unit or sleeping unit designed and constructed for accessibility in accordance with ICC A117.1.

DWELLING UNIT OR SLEEPING UNIT, TYPE B. A dwelling unit or sleeping unit designed and constructed for accessibility in accordance with ICC A117.1, in accordance with local governing requirements.

EMPLOYEE WORK AREA. All or any portion of a space used only by employees and only for work. Corridors, toilet rooms, kitchenettes and break rooms are not employee work areas.

FACILITY. All or any portion of buildings, structures, site improvements, elements and pedestrian or vehicular routes located on a site.

INTENDED TO BE OCCUPIED AS A RESIDENCE. This refers to a dwelling unit or sleeping unit that can or will be used all or part of the time as the occupant's place of abode.

MULTILEVEL ASSEMBLY SEATING. Seating that is arranged in distinct levels where each level is comprised of either multiple rows, or a single row of box seats accessed from a separate level.

PUBLIC ENTRANCE. An entrance that is not a service entrance or a restricted entrance.

PUBLIC-USE AREAS. Interior or exterior rooms or spaces that are made available to the general public.

RESTRICTED ENTRANCE. An entrance that is made available for common use on a controlled basis, but not public use, and that is not a service entrance.

SELF-SERVICE STORAGE FACILITY. Real property designed and used for the purpose of renting or leasing individual storage spaces to customers for the purpose of storing and removing personal property on a self-service basis.

SERVICE ENTRANCE. An entrance intended primarily for delivery of goods or services.

SITE. A parcel of land bounded by a property line or a designated portion of a public right-of-way.

WHEELCHAIR SPACE. A space for a single wheelchair and its occupant.

SECTION 9.3
SCOPING REQUIREMENTS

9.3.1 **Where required.** Buildings and structures, temporary or permanent, including their associated sites and facilities, shall be accessible to persons with physical disabilities.

9.3.2 **General exceptions.** Sites, buildings, facilities and elements shall be exempt from this chapter to the extent specified in this section.

9.3.2.1 **Specific requirements.** Accessibility is not required in buildings and facilities, or portions thereof, to the extent permitted by Sections 9.4 through 9.10.

9.3.2.2 **Existing buildings.** Existing buildings shall comply with Section 13.9.

9.3.2.3 **Employee work areas**. Spaces and elements within employee work areas shall only be required to comply with Chapter 7 of SBC 801, Sections 8.7 and 9.4.3.1 and shall be designed and constructed so that individuals with disabilities can approach, enter and exit the work area. Work areas, or portions of work areas, that are less than 14 m^2 in area and elevated 180 mm or more above the ground or finish floor where the elevation is essential to the function of the space shall be exempt from all requirements.

9.3.2.4 **Detached dwellings.** Detached one- and two-family dwellings and accessory structures, and their associated sites and facilities as applicable in Section 8.1.2, are not required to be accessible.

9.3.2.5 **Utility buildings.** Occupancies in Group U are exempt from the requirements of this chapter other than the following:

1. In agricultural buildings, access is required to paved work areas and areas open to the general public.
2. Private garages or carports that contain required accessible parking.

9.3.2.6 **Construction sites.** Structures, sites and equipment directly associated with the actual processes of construction including, but not limited to, scaffolding, bridging, materials hoists, materials storage or construction trailers are not required to be accessible.

9.3.2.7 **Raised areas.** Raised areas used primarily for purposes of security, life safety or fire safety including, but not limited to, observation galleries, prison guard towers, fire towers or lifeguard stands are not required to be accessible or to be served by an accessible route.

9.3.2.8 **Limited access spaces.** Nonoccupiable spaces accessed only by ladders, catwalks, crawl spaces, freight elevators or very narrow passageways are not required to be accessible.

9.3.2.9 **Equipment spaces.** Spaces frequented only by personnel for maintenance, repair or monitoring of equipment are not required to be accessible. Such spaces include, but are not limited to, elevator pits, elevator penthouses, mechanical, electrical or communications equipment rooms, piping or equipment catwalks, water or sewage treatment pump rooms and stations, electric substations and transformer vaults, and highway and tunnel utility facilities.

9.3.2.10 **Single-occupant structures.** Single-occupant structures accessed only by passageways below grade or elevated above grade including, but not limited to, toll booths that are accessed only by underground tunnels, are not required to be accessible.

9.3.2.11 **Residential Group R-1**. Buildings of Group R-1 containing not more than five sleeping units for rent or hire that are also occupied as the residence of the proprietor are not required to be accessible.

9.3.2.12 **Day care facilities.** Where a day care facility (Groups A-3, E, I-4 and R-3) is part of a dwelling unit, only the portion of the structure utilized for the day care facility is required to be accessible.

9.3.2.13 **Detention and correctional facilities**. In detention and correctional facilities, common use areas that are used only by inmates or detainees and security personnel, and that do not serve holding cells or housing cells required to be accessible, are not required to be accessible or to be served by an accessible route.

9.3.2.14 **Fuel-dispensing systems**. The operable parts on fuel-dispensing devices shall comply with ICC A117.1, Section 2.8.2.1 or 2.8.3.1.

SECTION 9.4
ACCESSIBLE ROUTE

9.4.1 **Site arrival points**. Accessible routes within the site shall be provided from public transportation stops, accessible parking and accessible passenger loading zones and public streets or sidewalks to the accessible building entrance served. **Exception:** An accessible route shall not be required between site arrival points and the building or facility entrance if the only means of access between them is a vehicular way not providing for pedestrian access.

9.4.2 **Within a site.** At least one accessible route shall connect accessible buildings, accessible facilities, accessible elements and accessible spaces that are on the same site.

Exception: An accessible route is not required between accessible buildings, accessible facilities, accessible elements and accessible spaces that have, as the only means of access between them, a vehicular way not providing for pedestrian access.

9.4.3 **Connected spaces.** When a building, or portion of a building, is required to be accessible, an accessible route shall be provided to each portion of the building, to accessible building entrances connecting accessible pedestrian walkways and the public way. Where only one accessible route is provided, the accessible route shall not pass through kitchens, storage rooms, restrooms, closets or similar spaces.

Exceptions:

1. In assembly areas with fixed seating required to be accessible, an accessible route shall not be required to serve fixed seating where wheelchair spaces or designated aisle seats required to be on an accessible route are not provided.
2. Accessible routes shall not be required to mezzanines provided that the building or facility has no more than one story, or where multiple stories are not connected by an accessible route as permitted by Section 9.4.4.
3. A single accessible route is permitted to pass through a kitchen or storage room in an accessible dwelling unit.

9.4.3.1 **Employee work areas.** Common use circulation paths within employee work areas shall be accessible routes.

Exceptions:

1. Common use circulation paths, located within employee work areas that are less than 28 m^2 in size and defined by permanently installed partitions, counters, casework or furnishings, shall not be required to be accessible routes.
2. Common use circulation paths, located within employee work areas, that are an integral component of equipment, shall not be required to be accessible routes.
3. Common use circulation paths, located within exterior employee work areas that are fully exposed to the weather, shall not be required to be accessible routes.

9.4.3.2 **Press boxes.** Press boxes in assembly areas shall be on an accessible route.

Exceptions:

1. An accessible route shall not be required to press boxes in bleachers that have points of entry at only one level, provided that the aggregate area of all press boxes is 46 m^2 maximum.
2. An accessible route shall not be required to freestanding press boxes that are elevated above grade 3.7 meters minimum provided that the aggregate area of all press boxes is 46 m^2 maximum.

9.4.4 **Multilevel buildings and facilities.** At least one accessible route shall connect each accessible level, including mezzanines, in multilevel buildings and facilities.

Exceptions:

1. An accessible route is not required to stories and mezzanines above and below accessible levels that have an aggregate area of not more than 280 m^2. This exception shall not apply to:
   1.1 Multiple tenant facilities of Group M occupancies containing five or more tenant spaces;
   1.2 Levels containing offices of health care providers (Group B or I); or

1.3 Passenger transportation facilities and airports (Group A-3 or B).
2. In Group A, I, R and S occupancies, levels that do not contain accessible elements or other spaces required by Section 9.7 or 9.8 are not required to be served by an accessible route from an accessible level.
3. In air traffic control towers, an accessible route is not required to serve the cab and the floor immediately below the cab.
4. Where a two-story building or facility has one story with an occupant load of five or fewer persons that does not contain public use space, that story shall not be required to be connected by an accessible route to the story above or below.

9.4.5 **Location.** Accessible routes shall coincide with or be located in the same area as a general circulation path. Where the circulation path is interior, the accessible route shall also be interior.

Exception: Accessible routes from parking garages contained within and serving Type B dwelling units are not required to be interior.

9.4.6 **Security barriers.** Security barriers including, but not limited to, security bollards and security check points shall not obstruct a required accessible route or accessible means of egress.

Exception: Where security barriers incorporate elements that cannot comply with these requirements, such as certain metal detectors, fluoroscopes or other similar devices, the accessible route shall be permitted to be provided adjacent to security screening devices. The accessible route shall permit persons with disabilities passing around security barriers to maintain visual contact with their personal items to the same extent provided others passing through the security barrier.

SECTION 9.5
ACCESSIBLE ENTRANCES

9.5.1 **Public entrances.** In addition to accessible entrances required by Sections 9.5.1.1 through 9.5.1.6, at least 50 percent of all public entrances shall be accessible.

Exceptions:

1. An accessible entrance is not required to areas not required to be accessible.
2. Loading and service entrances that are not the only entrance to a tenant space.

9.5.1.1 **Parking garage entrances**. Where provided, direct access for pedestrians from parking structures to buildings or facility entrances shall be accessible.

9.5.1.2 **Entrances from tunnels or elevated walkways**. Where direct access is provided for pedestrians from a pedestrian tunnel or elevated walkway to a building or facility, at least one entrance to the building or facility from each tunnel or walkway shall be accessible.

9.5.1.3 **Restricted entrances.** Where restricted entrances are provided to a building or facility, at least one restricted entrance to the building or facility shall be accessible.

9.5.1.4 **Entrances for inmates or detainees.** Where entrances used only by inmates or detainees and security personnel are provided at judicial facilities, detention facilities or correctional facilities, at least one such entrance shall be accessible.

9.5.1.5 **Service entrances.** If a service entrance is the only entrance to a building or a tenant space in a facility, that entrance shall be accessible.

9.5.1.6 **Tenant spaces, dwelling units and sleeping units.** At least one accessible entrance shall be provided to each tenant, dwelling unit and sleeping unit in a facility.

Exceptions:

1. An accessible entrance is not required to tenants that are not required to be accessible.
2. An accessible entrance is not required to dwelling units and sleeping units that are not required to be accessible units, Type A units or Type B units.

SECTION 9.6
PARKING AND PASSENGER LOADING FACILITIES

9.6.1 **Required.** Where parking is provided, accessible parking spaces shall be provided in compliance with Table 9.6.1, except as required by Sections 9.6.2 through 9.6.4. The number of accessible parking spaces shall be determined based on the total number of parking spaces provided for the facility.

Exception: This section does not apply to parking spaces used exclusively for buses, trucks, other delivery vehicles, law enforcement vehicles or vehicular impound and motor pools where lots accessed by the public are provided with an accessible passenger loading zone.

9.6.2 **Groups R-2 and R-3.** Two percent, but not less than one, of each type of parking space provided for occupancies in Groups R-2 and R-3, which are required to have accessible, Type A or Type B dwelling or sleeping units, shall be accessible. Where parking is provided within or beneath a building, accessible parking spaces shall also be provided within or beneath the building.

9.6.3 **Hospital outpatient facilities.** Ten percent of patient and visitor parking spaces provided to serve hospital outpatient facilities shall be accessible.

9.6.4 **Rehabilitation facilities and outpatient physical therapy facilities.** Twenty percent, but not less than one, of the portion of patient and visitor parking spaces serving rehabilitation facilities and outpatient physical therapy facilities shall be accessible.

9.6.5 **Van spaces.** For every six or fraction of six accessible parking spaces, at least one shall be a van-accessible parking space.

9.6.6 **Location.** Accessible parking spaces shall be located on the shortest accessible route of travel from adjacent parking to an accessible building entrance. Accessible parking spaces shall be dispersed among the various types of parking facilities provided. In parking facilities that do not serve a particular building, accessible parking spaces shall be located on the shortest route to an accessible pedestrian entrance to the parking facility. Where buildings have multiple accessible entrances with adjacent parking, accessible parking spaces shall be dispersed and located near the accessible entrances.

Exception: In multilevel parking structures, van-accessible parking spaces are permitted on one level.

TABLE 9.6.1
ACCESSIBLE PARKING SPACES

TOTAL PARKING SPACES PROVIDED	REQUIRED MINIMUM NUMBER OF ACCESSIBLE SPACES
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1,000	2% of total
More than 1,000	20, plus one for each 100 over 1,000

9.6.7 **Passenger loading zones.** Passenger loading zones shall be designed and constructed in accordance with ICC A117.1.

9.6.7.1 **Continuous loading zones.** Where passenger loading zones are provided, one passenger loading zone in every continuous 30.4 m maximum of loading zone space shall be accessible.

9.6.7.2 **Medical facilities.** A passenger loading zone shall be provided at an accessible entrance to licensed medical and long-term care facilities where people receive physical or medical treatment or care and where the period of stay exceeds 24 hours.

9.6.7.3 **Valet parking.** A passenger loading zone shall be provided at valet parking services.

SECTION 9.7
DWELLING UNITS AND SLEEPING UNITS

9.7.1 **General.** In addition to the other requirements of this chapter, occupancies having dwelling units or sleeping units shall be provided with accessible features in accordance with this section.

9.7.2 **Design.** Dwelling units and sleeping units which are required to be accessible units shall comply with these code requirements and the applicable portions of Chapters 1 through 9 of ICC A117.1. Type A and Type B units shall comply with the applicable portions of Chapter 8 of ICC A117.1. Units required to be Type A units are permitted to be designed and constructed as accessible units. Units required to be Type B units are permitted to be designed and constructed as accessible units or as Type A units.

9.7.3 **Accessible spaces.** Rooms and spaces available to the general public or available for use by residents and serving accessible units, Type A units or Type B units shall be accessible. Accessible spaces shall include toilet and bathing rooms for each gender, kitchen, living and dining areas and any exterior spaces, including patios, terraces and balconies.

Exception: Recreational facilities in accordance with Section 9.9.14.

9.7.4 **Accessible route.** At least one accessible route shall connect accessible building or facility entrances with the primary entrance of each accessible unit, Type A unit and Type B unit within the building or facility and with those exterior and interior spaces and facilities that serve the units.

Exceptions:

1. If the slope of the finished ground level between accessible facilities and buildings exceeds one unit vertical in 12 units horizontal (1:12), or where physical barriers prevent the installation of an accessible route, a vehicular route with parking that complies with Section 1106 at each public or common use facility or building is permitted in place of the accessible route.
2. Exterior decks, patios or balconies that are part of Type B units and have impervious surfaces, and that are not more than 102 mm below the finished floor level of the adjacent interior space of the unit.

9.7.5 **Group I.** Occupancies in Group I shall be provided with accessible features in accordance with Sections 9.7.5.1 through 9.7.5.5.

9.7.5.1 **Group I-1.** Group I-1 occupancies shall be provided with accessible features in accordance with Sections 9.7.5.1.1 and 9.7.5.1.2.

9.7.5.1.1 **Accessible units.** At least 4 percent, but not less than one, of the dwelling units and sleeping units shall be accessible units.

9.7.5.1.2 **Type B units**. In structures with four or more dwelling or sleeping units intended to be occupied as a residence, every dwelling and sleeping unit intended to be occupied as a residence shall be a Type B unit.

Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.5.2 **Group I-2 Elderly care centers.** Elderly care centers of Group I-2 shall be provided with accessible features in accordance with Sections 9.7.5.2.1 and 9.7.5.2.2.

9.7.5.2.1 **Accessible units.** At least 50 percent, but not less than one, of the dwelling units and sleeping units shall be accessible units.

9.7.5.2.2 **Type B units.** In structures with four or more dwelling or sleeping units intended to be occupied as a residence, every dwelling and sleeping unit intended to be occupied as a residence shall be a Type B unit.

Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.5.3 **Group I-2 Hospitals.** General-purpose hospitals, psychiatric facilities, detoxification facilities and residential care/assisted living facilities of Group I-2 shall be provided with accessible features in accordance with Sections 9.7.5.3.1 and 9.7.5.3.2.

9.7.5.3.1 **Accessible units**. At least 10 percent, but not less than one, of the dwelling units and sleeping units shall be accessible units.

9.7.5.3.2 **Type B units.** In structures with four or more dwelling or sleeping units intended to be occupied as a residence, every dwelling and sleeping unit intended to be occupied as a residence shall be a Type B unit.

Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.5.4 **Group I-2 Rehabilitation facilities**. In hospitals and rehabilitation facilities of Group I-2 which specialize in treating conditions that affect mobility, or units within either which specialize in treating conditions that affect mobility, 100 percent of the dwelling units and sleeping units shall be accessible units.

9.7.5.5 **Group I-3.** Buildings, facilities or portions thereof with Group I-3 occupancies

shall comply with Sections 9.7.5.5.1 through 9.7.5.5.3.

9.7.5.5.1 **Group I-3 Sleeping units.** In occupancies in Group I-3, at least 2 percent, but not less than one, of the dwelling units and sleeping units shall be accessible units.

9.7.5.5.2 **Special holding cells and special housing cells or rooms.** In addition to the units required to be accessible by Section 9.7.5.5.1, where special holding cells or special housing cells or rooms are provided, at least one serving each purpose shall be accessible. Cells or rooms subject to this requirement include, but are not limited to, those used for purposes of orientation, protective custody, administrative or disciplinary detention or segregation, detoxification and medical isolation.

Exception: Cells or rooms specially designed without protrusions and that are used solely for purposes of suicide prevention shall not be required to include grab bars.

9.7.5.5.3 **Medical care facilities.** Patient sleeping units or cells required to be accessible in medical care facilities shall be provided in addition to any medical isolation cells required to comply with Section 9.7.5.5.2.

9.7.6 **Group R.** Occupancies in Group R shall be provided with accessible features in accordance with Sections 9.7.6.1 through 9.7.6.4.

9.7.6.1 **Group R-1.** Group R-1 occupancies shall be provided with accessible features in accordance with Sections 9.7.6.1.1 and 9.7.6.1.2.

9.7.6.1.1 **Accessible units.** In occupancies in Group R-1, accessible dwelling units and sleeping units shall be provided in accordance with Table 9.7.6.1.1. All facilities on a site shall be considered to determine the total number of accessible units. Accessible units shall be dispersed among the various classes of units. Roll-in showers provided in accessible units shall include a permanently mounted folding shower seat.

9.7.6.1.2 **Type B units.** In structures with four or more dwelling or sleeping units intended to be occupied as a residence, every dwelling and sleeping unit intended to be occupied as a residence shall be a Type B unit.

Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.6.2 **Group R-2.** Accessible units, Type A units and Type B units shall be provided in occupancies in Group R-2 in accordance with Sections 9.7.6.2.1 and 9.7.6.2.2.

9.7.6.2.1 **Apartment houses.** Type A and Type B units shall be provided in apartment houses, in accordance with Sections 9.7.6.2.1.1 and 9.7.6.2.1.2.

9.7.6.2.1.1 **Type A units.** In occupancies in Group R-2 containing more than 20 dwelling units or sleeping units, at least 2 percent, but not less than one, of the units shall be a Type A unit. All units on a site shall be considered to determine the total number of units and the required number of Type A units. Type A units shall be dispersed among the various classes of units.

Exceptions:

1. The number of Type A units is permitted to be reduced in accordance with Section 9.7.7.
2. Existing structures on a site shall not contribute to the total number of units on a site.

TABLE 9.7.6.1.1
ACCESSIBLE DWELLING AND SLEEPING UNITS

TOTAL NUMBER OF UNITS PROVIDED	MINIMUM REQUIRED NUMBER OF ACCESSIBLE UNITS ASSOCIATED WITH ROLL-IN SHOWERS	TOTAL NUMBER OF REQUIRED ACCESSIBLE UNITS
1 to 25	0	1
26 to 50	0	2
51 to 75	1	4
76 to 100	1	5
101 to 150	2	7
151 to 200	2	8
201 to 300	3	10
301 to 400	4	12
401 to 500	4	13
501 to 1,000	1% of total	3% of total
Over 1,000	10, plus 1 for each 100 over 1,000	30, plus 2 for each 100 over 1,000

9.7.6.2.1.2 **Type B units.** Where there are four or more dwelling units or sleeping units intended to be occupied as a residence in a single structure, every dwelling unit and sleeping unit intended to be occupied as a residence shall be a Type B unit.
Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.6.2.2 **Boarding houses, dormitories, fraternity houses and sorority houses.** Accessible units and Type B dwelling units shall be provided in boarding houses, dormitories, fraternity houses and sorority houses in accordance with Sections 9.7.6.2.2.1 and 9.7.6.2.2.2.

9.7.6.2.2.1 **Accessible units.** Accessible dwelling units and sleeping units shall be provided in accordance with Table 9.7.6.1.1.

9.7.6.2.2.2 **Type B units.** Where there are four or more dwelling units or sleeping units intended to be occupied as a residence in a single structure, every dwelling unit and every sleeping unit intended to be occupied as a residence shall be a Type B unit.
Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.6.3 **Group R-3.** In occupancies in Group R-3 where there are four or more dwelling units or sleeping units intended to be occupied as a residence in a single structure, every dwelling and sleeping unit intended to be occupied as a residence shall be a Type B unit.
Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.6.4 **Group R-4.** Group R-4 occupancies shall be provided with accessible features in accordance with Sections 9.7.6.4.1 and 9.7.6.4.2.

9.7.6.4.1 **Accessible units**. At least one of the dwelling or sleeping units shall be an accessible unit.

9.7.6.4.2 **Type B units.** In structures with four or more dwelling or sleeping units intended

to be occupied as a residence, every dwelling and sleeping unit intended to be occupied as a residence shall be a Type B unit.

Exception: The number of Type B units is permitted to be reduced in accordance with Section 9.7.7.

9.7.7 **General exceptions.** Where specifically permitted by Section 9.7.5 or 9.7.6, the required number of Type A and Type B units is permitted to be reduced in accordance with Sections 9.7.7.1 through 9.7.7.5.

9.7.7.1 **Buildings without elevator service.** Where no elevator service is provided in a building, only the dwelling and sleeping units that are located on stories indicated in Sections 9.7.7.1.1 and 9.7.7.1.2 are required to be Type A and Type B units. The number of Type A units shall be determined in accordance with Section 9.7.6.2.1.1.

9.7.7.1.1 **One story with Type B units required.** At least one story containing dwelling units or sleeping units intended to be occupied as a residence shall be provided with an accessible entrance from the exterior of the building and all units intended to be occupied as a residence on that story shall be Type B units.

9.7.7.1.2 **Additional stories with Type B units.** On all other stories that have a building entrance in proximity to arrival points intended to serve units on that story, as indicated in Items 1 and 2, all dwelling units and sleeping units intended to be occupied as a residence served by that entrance on that story shall be Type B units.

1. Where the slopes of the undisturbed site measured between the planned entrance and all vehicular or pedestrian arrival points within 15. meters of the planned entrance are 10 percent or less, and
2. Where the slopes of the planned finished grade measured between the entrance and all vehicular or pedestrian arrival points within 15 meters of the planned entrance are 10 percent or less.

   Where no such arrival points are within 15 meters of the entrance, the closest arrival point shall be used unless that arrival point serves the story required by Section 9.7.7.1.1.

9.7.7.2 **Multistory units.** A multistory dwelling or sleeping unit which is not provided with elevator service is not required to be a Type B unit. Where a multistory unit is provided with external elevator service to only one floor, the floor provided with elevator service shall be the primary entry to the unit, shall comply with the requirements for a Type B unit and a toilet facility shall be provided on that floor.

9.7.7.3 **Elevator service to the lowest story with units**. Where elevator service in the building provides an accessible route only to the lowest story containing dwelling or sleeping units intended to be occupied as a residence, only the units on that story which are intended to be occupied as a residence are required to be Type B units.

9.7.7.4 **Site impracticality**. On a site with multiple nonelevator buildings, the number of units required by Section 9.7.7.1 to be Type B units is permitted to be reduced to a percentage which is equal to the percentage of the entire site having grades, prior to development, which are less than 10 percent, provided that all of the following conditions are met:

1. Not less than 20 percent of the units required by Section 9.7.7.1 on the site are Type B units;
2. Units required by Section 9.7.7.1, where the slope between the building entrance serving the units on that story and a pedestrian or vehicular arrival point is no greater than 8.33 percent, are Type B units;
3. Units required by Section 9.7.7.1, where an elevated walkway is planned between a building entrance serving the units on that story and a pedestrian or

vehicular arrival point and the slope between them is 10 percent or less are Type B units; and

4. Units served by an elevator in accordance with Section 9.7.7.3 are Type B units.

9.7.7.5 **Design flood elevation.** The required number of Type A and Type B units shall not apply to a site where the lowest floor or the lowest structural building members of nonelevator buildings are required to be at or above the design flood elevation resulting in:

1. A difference in elevation between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 15.2 meters exceeding 800 mm, and

2. A slope exceeding 10 percent between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 15.2 meters.

Where no such arrival points are within 15.2 meters of the primary entrances, the closest arrival point shall be used.

SECTION 9.8
SPECIAL OCCUPANCIES

9.8.1 **General.** In addition to the other requirements of this chapter, the requirements of Sections 9.8.2 through 9.8.4 shall apply to specific occupancies.

9.8.2 **Assembly area seating.** Assembly areas with fixed seating shall comply with Sections 9.8.2.1 through 9.8.2.8. Dining areas shall comply with Section 9.8.2.9.

9.8.2.1 **Services.** Services and facilities provided in areas not required to be accessible shall be provided on an accessible level and shall be accessible.

9.8.2.2 **Wheelchair spaces.** In theaters, bleachers, grandstands, stadiums, arenas and other fixed seating assembly areas, accessible wheelchair spaces complying with ICC A117.1 shall be provided in accordance with Sections 9.8.2.2.1 through 9.8.2.2.5.

9.8.2.2.1 **General seating**. Wheelchair spaces shall be provided in accordance with Table 9.8.2.2.1.

TABLE 9.8.2.2.1
ACCESSIBLE WHEELCHAIR SPACES

CAPACITY OF SEATING IN ASSEMBLY AREAS	MINIMUM REQUIRED NUMBER OF WHEELCHAIR SPACES
4 to 25	1
26 to 50	2
51 to 100	4
101 to 300	5
301 to 500	6
501 to 5,000	6, plus 1 for each 150, or fraction thereof, between 501 through 5,000
5,001 and over	36 plus 1 for each 200, or fraction thereof, over 5,000

9.8.2.2.2 **Luxury boxes, club boxes and suites.** In each luxury box, club box, and suite within arenas, stadiums and grandstands, wheelchair spaces shall be provided in accordance with Table 9.8.2.2.1.

9.8.2.2.3 **Other boxes.** In boxes other than those required to comply with Section 9.8.2.2.2, the total number of wheelchair spaces provided shall be determined in accordance

with Table 9.8.2.2.1. Wheelchair spaces shall be located in not less than 20 percent of all boxes provided.

9.8.2.3 **Integration.** Wheelchair spaces shall be an integral part of the seating plan.

9.8.2.4 **Dispersion of wheelchair spaces.** Dispersion of wheelchair spaces shall be based on the availability of accessible routes to various seating areas including seating at various levels in multilevel facilities.

9.8.2.4.1 **Multilevel assembly seating areas.** In multilevel assembly seating areas, wheelchair spaces shall be provided on the main floor level and on one of each two additional floor or mezzanine levels. Wheelchair spaces shall be provided in each luxury box, club box and suite within assembly facilities.

Exceptions:

1. In multilevel assembly spaces utilized for lectures services, where the second floor or mezzanine level contains 25 percent or less of the total seating capacity, wheelchair spaces shall be permitted to all be located on the main level.
2. In multilevel assembly seating where the second floor or mezzanine level provides 25 percent or less of the total seating capacity and 300 or fewer seats, wheelchair spaces shall be permitted to all be located on the main level.

9.8.2.5 **Companion seats.** At least one companion seat complying with ICC A117.1 shall be provided for each wheelchair space required by Section 9.8.2.2.

9.8.2.6 **Designated aisle seats.** At least five percent, but not less than one, of the total number of aisle seats provided shall be designated aisle seats.

9.8.2.7 **Assistive listening systems.** Each assembly area where audible communications are integral to the use of the space shall have an assistive listening system.

Exception: Other than in courtrooms, an assistive listening system is not required where there is no audio amplification system.

9.8.2.7.1 **Receivers.** Receivers shall be provided for assistive listening systems in accordance with Table 9.8.2.7.1.

Exception: Where a building contains more than one assembly area, the total number of required receivers shall be permitted to be calculated according to the total number of seats in the assembly areas in the building provided that all receivers are usable with all systems, and if assembly areas required to provide assistive listening are under one management.

TABLE 9.8.2.7.1
REQUIRED NUMBER OF RECEIVERS

CAPACITY OF SEATING IN ASSEMBLY AREAS	MINIMUM REQUIRED NUMBER OF RECEIVERS	MINIMUM NUMBER OF RECEIVERS TO BE HEARING-AID COMPATIBLE
50 or less	2	2
51 to 200	2, plus 1 per 25 seats over 50 seats*	2
201 to 500	2, plus 1 per 25 seats over 50 seats.*	1 per 4 receivers*
501 to 1,000	20, plus 1 per 33 seats over 500 seats*	1 per 4 receivers*
1,001 to 2,000	35, plus 1 per 50 seats over 1,000 seats*	1 per 4 receivers*
Over 2,000	55, plus 1 per 100 seats over 2,000 seats*	1 per 4 receivers*

NOTE: *= or fraction thereof.

9.8.2.7.2 **Public address systems.** Where stadiums, arenas and grandstands provide audible public announcements, they shall also provide equivalent text information regarding events and facilities in compliance with Sections 9.8.2.7.2.1 and 9.8.2.7.2.2.

9.8.2.7.2.1 **Prerecorded text messages.** Where electronic signs are provided and have the capability to display prerecorded text messages containing information that is the same, or substantially equivalent, to information that is provided audibly, signs shall display text that is equivalent to audible announcements.

Exception: Announcements that cannot be prerecorded in advance of the event shall not be required to be displayed.

9.8.2.7.2.2 **Real-time messages.** Where electronic signs are provided and have the capability to display real-time messages containing information that is the same, or substantially equivalent, to information that is provided audibly, signs shall display text that is equivalent to audible announcements.

9.8.2.8 **Performance areas.** An accessible route shall directly connect the performance area to the assembly seating area where a circulation path directly connects a performance area to an assembly seating area. An accessible route shall be provided from performance areas to ancillary areas or facilities used by performers.

9.8.2.9 **Dining areas.** In dining areas, the total floor area allotted for seating and tables shall be accessible.

Exceptions:

1. In buildings or facilities not required to provide an accessible route between levels, an accessible route to a mezzanine seating area is not required, provided that the mezzanine contains less than 25 percent of the total area and the same services are provided in the accessible area.
2. In sports facilities, tiered dining areas providing seating required to be accessible shall be required to have accessible routes serving at least 25 percent of the dining area, provided that accessible routes serve accessible seating and where each tier is provided with the same services.

9.8.2.9.1 **Dining surfaces.** Where dining surfaces for the consumption of food or drink are provided, at least 5 percent, but not less than one, of the seating and standing spaces at the dining surfaces shall be accessible and be distributed throughout the facility.

9.8.3 **Self-service storage facilities.** Self-service storage facilities shall provide accessible individual self-storage spaces in accordance with Table 9.8.3.

TABLE 9.8.3
ACCESSIBLE SELF-SERVICE STORAGE FACILITIES

TOTAL SPACES IN FACILITY	MINIMUM NUMBER OF REQUIRED ACCESSIBLE SPACES
1 to 200	5%, but not less than 1
Over 200	10, plus 2% of total number of units over 200

9.8.3.1 **Dispersion.** Accessible individual self-service storage spaces shall be dispersed throughout the various classes of spaces provided. Where more classes of spaces are provided than the number of required accessible spaces, the number of accessible spaces shall not be required to exceed that required by Table 9.8.3. Accessible spaces are permitted to be dispersed in a single building of a

multibuilding facility.

9.8.4 **Judicial facilities.** Judicial facilities shall comply with Sections 9.8.4.1 through 9.8.4.3.

9.8.4.1 **Courtrooms.** Each courtroom shall be accessible.

9.8.4.2 **Holding cells.** Where provided, central holding cells and court-floor holding cells shall comply with Sections 9.8.4.2.1 and 9.8.4.2.2.

9.8.4.2.1 **Central holding cells.** Where separate central holding cells are provided for adult males, juvenile males, adult females or juvenile females, one of each type shall be accessible. Where central holding cells are provided and are not separated by age or sex, at least one accessible cell shall be provided.

9.8.4.2.2 **Court-floor holding cells.** Where separate court-floor holding cells are provided for adult males, juvenile males, adult females or juvenile females, each courtroom shall be served by one accessible cell of each type. Where court-floor holding cells are provided and are not separated by age or sex, courtrooms shall be served by at least one accessible cell. Accessible cells shall be permitted to serve more than one courtroom.

9.8.4.3 **Visiting areas.** Visiting areas shall comply with Sections 9.8.4.3.1 and 9.8.4.3.2.

9.8.4.3.1 **Cubicles and counters.** At least 5 percent, but no fewer than one, of cubicles shall be accessible on both the visitor and detainee sides. Where counters are provided, at least one shall be accessible on both the visitor and detainee sides.

Exception: This requirement shall not apply to the detainee side of cubicles or counters at noncontact visiting areas not serving holding cells.

9.8.4.3.2 **Partitions.** Where solid partitions or security glazing separate visitors from detainees, at least one of each type of cubicle or counter partition shall be accessible.

SECTION 9.9
OTHER FEATURES AND FACILITIES

9.9.1 **General.** Accessible building features and facilities shall be provided in accordance with Sections 9.9.2 through 9.9.15.

Exception: Type A and Type B dwelling and sleeping units shall comply with ICC A117.1.

9.9.2 **Toilet and bathing facilities.** Toilet rooms and bathing facilities shall be accessible. Where a floor level is not required to be connected by an accessible route, the only toilet rooms or bathing facilities provided within the facility shall not be located on the inaccessible floor. At least one of each type of fixture, element, control or dispenser in each accessible toilet room and bathing facility shall be accessible.

Exceptions:

1. In toilet rooms or bathing facilities accessed only through a private office, not for common or public use, and intended for use by a single occupant, any of the following alternatives are allowed:

1.1 Doors are permitted to swing into the clear floor space provided the door swing can be reversed to meet the requirements in ICC A117.1,

1.2 The height requirements for the water closet in ICC A117.1 are not applicable,

1.3 Grab bars are not required to be installed in a toilet room, provided that reinforcement has been installed in the walls and located so as to permit the installation of such grab bars, and

1.4 The requirement for height, knee and toe clearance shall not apply to a lavatory.

2. This section is not applicable to toilet and bathing facilities that serve dwelling units or sleeping units that are not required to be accessible by Section 9.7.

3. Where multiple single-user toilet rooms or bathing facilities are clustered at a single location and contain fixtures in excess of the minimum required number of plumbing fixtures, at least 5 percent, but not less than one room for each use at each cluster, shall be accessible.

4. Toilet room fixtures that are in excess of those required by the SBC 701 and that are designated for use by children in day care and primary school occupancies.

5. Where no more than one urinal is provided in a toilet room or bathing facility, the urinal is not required to be accessible.

6. Toilet rooms that are part of critical-care or intensive-care patient sleeping rooms are not required to be accessible.

9.9.2.1 **Unisex toilet and bathing rooms.** In assembly and mercantile occupancies, an accessible unisex toilet room shall be provided where an aggregate of six or more male and female water closets is required. In buildings of mixed occupancy, only those water closets required for the assembly or mercantile occupancy shall be used to determine the unisex toilet room requirement. In recreational facilities where bathing rooms are provided, an accessible separate-sex bathing rooms shall be provided. Fixtures located within each toilet and bathing room shall be included in determining the number of fixtures provided in an occupancy.

9.9.2.1.1 **Standard.** Unisex toilet rooms shall comply with Sections 9.9.2.1.2 through 9.9.2.1.7 and ICC A117.1.

9.9.2.1.2 **Unisex toilet rooms.** Unisex toilet rooms shall include only one water closet and only one lavatory.

Exception: A urinal is permitted to be provided in addition to the water closet in a unisex toilet room.

9.9.2.1.3 **Bathing rooms**. Bathing rooms shall include only one shower or bathtub fixture. Bathing rooms shall also include one water closet and one lavatory. Where storage facilities are provided for separate-sex bathing rooms, accessible storage facilities shall be provided for bathing rooms.

9.9.2.1.4 **Location.** Unisex toilet and bathing rooms shall be located on an accessible route. Unisex toilet rooms shall be located not more than one story above or below separate-sex toilet rooms. The accessible route from any separate-sex toilet room to a unisex toilet room shall not exceed 150 meters.

9.9.2.1.5 **Prohibited location.** In passenger transportation facilities and airports, the accessible route from separate-sex toilet rooms to a unisex toilet room shall not pass through security checkpoints.

9.9.2.1.6 **Clear floor space.** Where doors swing into a unisex toilet or bathing room, a clear floor space not less than 800 mm by 1200 mm shall be provided, within the room, beyond the area of the door swing.

9.9.2.1.7 **Privacy.** Doors to unisex toilet and bathing rooms shall be securable from within the room.

9.9.2.2 **Water closet compartment.** Where water closet compartments are provided in a toilet room or bathing facility, at least one wheelchair-accessible compartment shall be provided. Where the combined total water closet compartments and urinals provided in a toilet room or bathing facility is six or more, at least one ambulatory-accessible water closet compartment shall be provided in addition to the wheelchair-accessible compartment. Wheelchair-accessible and ambulatory-accessible compartments shall comply with ICC A117.1.

9.9.3 **Sinks.** Where sinks are provided, at least 5 percent, but not less than one, provided in accessible spaces shall comply with ICC A117.1.

Exceptions:

1. Mop or service sinks are not required to be accessible.
2. Sinks designated for use by children in day care and primary school occupancies.

9.9.4 **Kitchens and kitchenettes.** Where kitchens and kitchenettes are provided in accessible spaces or rooms, they shall be accessible in accordance with ICC A117.1.

9.9.5 **Drinking fountains.** On floors where drinking fountains are provided, at least 50 percent, but not less than one fountain, shall be accessible.

9.9.6 **Elevators.** Passenger elevators on an accessible route shall be accessible and comply with SBC 501.

9.9.7 **Lifts.** Platform (wheelchair) lifts are permitted to be a part of a required accessible route in new construction where indicated in Items 1 through 7. Platform (wheelchair) lifts shall be installed in accordance with ASME A18.1.

1. An accessible route to a performing area and speakers'. Platforms in occupancies in Group A.
2. An accessible route to wheelchair spaces required to comply with the wheelchair space dispersion requirements of Section 9.8.2.2 through 9.8.2.4.
3. An accessible route to spaces that are not open to the general public with an occupant load of not more than five.
4. An accessible route within a dwelling or sleeping unit.
5. An accessible route to wheelchair seating spaces located in outdoor dining terraces in A-5 occupancies where the means of egress from the dining terraces to a public way are open to the outdoors.
6. An accessible route to raised judges' benches, clerks' stations, jury boxes, witness stands and other raised or depressed areas in a court.
7. An accessible route where existing exterior site constraints make use of a ramp or elevator infeasible.

9.9.8 **Storage.** Where fixed or built-in storage elements such as cabinets, shelves, medicine cabinets, closets and drawers are provided in required accessible spaces, at least one of each type shall contain storage space complying with ICC A117.1.

9.9.8.1 **Lockers.** Where lockers are provided in accessible spaces, at least five percent, but not less than one, of each type shall be accessible.

9.9.8.2 **Shelving and display units.** Self-service shelves and display units shall be located on an accessible route. Such shelving and display units shall not be required to comply with reach-range provisions.

9.9.8.3 **Coat hooks and folding shelves.** Where coat hooks and folding shelves are provided in toilet rooms, toilet compartments, or in dressing, fitting or locker rooms, at least one of each type shall be accessible and shall be provided in accessible toilet rooms without toilet compartments, accessible toilet compartments and accessible dressing, fitting and locker rooms.

9.9.9 **Detectable warnings.** Passenger transit platform edges bordering a drop-off and not protected by platform screens or guards shall have a detectable warning.

Exception: Detectable warnings are not required at bus stops.

9.9.10 **Assembly area seating.** Assembly areas with fixed seating in every occupancy shall comply with Section 9.8.2 for accessible seating and assistive listening devices.

9.9.11 **Seating at tables counters and work surfaces.** Where seating or standing space at fixed or built-in tables, counters or work surfaces is provided in accessible spaces, at least 5 percent of the seating and standing spaces, but not less than one, shall be accessible. In Group I-3 occupancy visiting areas at least 5 percent, but not less than one, cubicle or counter shall be accessible on both the visitor and detainee sides.

Exceptions:

1. Check-writing surfaces at check-out aisles not required to comply with Section 9.9.12.2 are not required to be accessible.
2. In Group I-3 occupancies, the counter or cubicle on the detainee side is not required to be accessible at noncontact visiting areas or in areas not serving accessible holding cells or sleeping units.

9.9.11.1 **Dispersion.** Accessible fixed or built-in seating at tables, counters or work surfaces shall be distributed throughout the space or facility containing such elements.

9.9.12 **Service facilities.** Service facilities shall provide for accessible features in accordance with Sections 9.9.12.1 through 9.9.12.5.

9.9.12.1 **Dressing, fitting and locker rooms.** Where dressing rooms, fitting rooms or locker rooms are provided, at least 5 percent, but not less than one, of each type of use in each cluster provided shall be accessible.

9.9.12.2 **Check-out aisles.** Where check-out aisles are provided, accessible check-out aisles shall be provided in accordance with Table 9.9.12.2. Where check-out aisles serve different functions, at least one accessible check-out aisle shall be provided for each function. Where checkout aisles serve different functions, accessible check-out aisles shall be provided in accordance with Table 9.9.12.2 for each function. Where check-out aisles are dispersed throughout the building or facility, accessible check-out aisles shall also be dispersed. Traffic control devices, security devices and turnstiles located in accessible check-out aisles or lanes shall be accessible.

Exception: Where the area of the selling space is less than 465 m^2, only one check-out aisle is required to be accessible.

TABLE 9.9.12.2
ACCESSIBLE CHECK-OUT AISLES

TOTAL CHECK-OUT AISLES OF EACH FUNCTION	MINIMUM NUMBER OF ACCESSIBLE CHECK-OUT AISLES OF EACH FUNCTION
1 to 4	1
5 to 8	2
9 to 15	3
Over 15	3, plus 20% of additional aisles

9.9.12.3 **Point of sale and service counters.** Where counters are provided for sales or distribution of goods or services, at least one of each type provided shall be accessible. Where such counters are dispersed throughout the building or facility,

accessible counters shall also be dispersed.

9.9.12.4 **Food service lines.** Food service lines shall be accessible. Where self-service shelves are provided, at least 50 percent, but not less than one, of each type provided shall be accessible.

9.9.12.5 **Queue and waiting lines.** Queue and waiting lines servicing accessible counters or check-out aisles shall be accessible.

9.9.13 **Controls, operating mechanisms and hardware.** Controls, operating mechanisms and hardware intended for operation by the occupant, including switches that control lighting and ventilation, and electrical convenience outlets, in accessible spaces, along accessible routes or as parts of accessible elements shall be accessible.

Exceptions:

1. Operable parts that are intended for use only by service or maintenance personnel shall not be required to be accessible.
2. Electrical or communication receptacles serving a dedicated use shall not be required to be accessible.
3. Where two or more outlets are provided in a kitchen above a length of counter top that is uninterrupted by a sink or appliance, one outlet shall not be required to be accessible.
4. Floor electrical receptacles shall not be required to be accessible.
5. HVAC diffusers shall not be required to be accessible.
6. Except for light switches, where redundant controls are provided for a single element, one control in each space shall not be required to be accessible.

9.9.13.1 **Operable windows.** Where operable windows are provided in rooms that are required to be accessible in accordance with Sections 9.7.5.1.1, 9.7.5.2.1, 9.7.5.3.1, 9.7.5.4, 9.7.6.1.1, 9.7.6.2.2.1 and 9.7.6.4.1, at least one window in each room shall be accessible and each required operable window shall be accessible.

Exception: Accessible windows are not required in bathrooms or kitchens.

9.9.14 **Recreational facilities.** Recreational facilities shall be provided with accessible features in accordance with Sections 9.9.14.1 through 9.9.14.3.

9.9.14.1 **Facilities serving a single building.** In Group R-2 and R-3 occupancies where recreational facilities are provided serving a single building containing Type A or Type B units, 25 percent, but not less than one, of each type of recreational facility shall be accessible. Every recreational facility of each type on a site shall be considered to determine the total number of each type that is required to be accessible.

9.9.14.2 **Facilities serving multiple buildings.** In Group R-2 and R-3 occupancies on a single site where multiple buildings containing Type A or Type B units are served by recreational facilities, 25 percent, but not less than one, of each type of recreational facility serving each building shall be accessible. The total number of each type of recreational facility that is required to be accessible shall be determined by considering every recreational facility of each type serving each building on the site.

9.9.14.3 **Other occupancies.** All recreational facilities not falling within the purview of Section 9.9.14.1 or 9.9.14.2 shall be accessible.

9.9.15 **Stairways.** Stairways located along accessible routes connecting floor levels that are not connected by an elevator shall be designed and constructed to comply with ICC A117.1 and Chapter 8.

SECTION 9.10
SIGNAGE

9.10.1 **Signs.** Required accessible elements shall be identified by the International Symbol of Accessibility at the following locations:

1. Accessible parking spaces required by Section 9.6.1 except where the total number of parking spaces provided is four or less.
2. Accessible passenger loading zones.
3. Accessible areas of refuge required by Section 8.7.6.
4. Accessible rooms where multiple single-user toilet or bathing rooms are clustered at a single location.
5. Accessible entrances where not all entrances are accessible.
6. Accessible check-out aisles where not all aisles are accessible. The sign, where provided, shall be above the check-out aisle in the same location as the check-out aisle number or type of check-out identification.
7. Unisex toilet and bathing rooms.
8. Accessible dressing, fitting and locker rooms where not all such rooms are accessible.

9.10.2 **Directional signage.** Directional signage indicating the route to the nearest like accessible element shall be provided at the following locations. These directional signs shall include the International Symbol of Accessibility:

1. Inaccessible building entrances.
2. Inaccessible public toilets and bathing facilities.
3. Elevators not serving an accessible route.
4. At each separate-sex toilet and bathing room indicating the location of the nearest unisex toilet or bathing room where provided in accordance with Section 9.9.2.1.
5. At exits and elevators serving a required accessible space, but not providing an approved accessible means of egress, signage shall be provided in accordance with Section 8.7.7.

9.10.3 **Other signs.** Signage indicating special accessibility provisions shall be provided as shown:

1. Each assembly area required to comply with Section 9.8.2.7 shall provide a sign notifying patrons of the availability of assistive listening systems.
   Exception: Where ticket offices or windows are provided, signs are not required at each assembly area provided that signs are displayed at each ticket office or window informing patrons of the availability of assistive listening systems.
2. At each door to an egress stairway, exit passageway and exit discharge, signage shall be provided in accordance with Section 8.11.3.
3. At areas of refuge, signage shall be provided in accordance with Sections 8.7.6.3 through 8.7.6.5.

At areas for assisted rescue, signage shall be provided in accordance with Section 8.7.8.3.

CHAPTER 10
GYPSUM BOARD AND PLASTER

SECTION 10.1
GENERAL

10.1.1 Scope.

10.1.1.1 General. Provisions of this chapter shall govern the materials, design, construction and quality of gypsum board, lath, gypsum plaster and cement plaster.

10.1.1.2 Performance. Lathing, plastering and gypsum board construction shall be done in the manner and with the materials specified in this chapter, and when required for fire protection, shall also comply with the provisions of Chapter 7.

10.1.1.3 Other materials. Other approved wall or ceiling coverings shall be permitted to be installed in accordance with the recommendations of the manufacturer and the conditions of approval.

SECTION 10.2
DEFINITIONS

10.2.1 Definitions. The following words and terms shall, for the purposes of this chapter and as used elsewhere in these code requirements, have the meanings shown herein.

CEMENT PLASTER. A mixture of portland or blended cement, portland cement or blended cement and hydrated lime, masonry cement or plastic cement and aggregate and other approved materials as specified in this code requirements.

EXTERIOR SURFACES. Weather-exposed surfaces.

GYPSUM BOARD. Gypsum wallboard, gypsum sheathing, gypsum base for gypsum veneer plaster, exterior gypsum soffit board, predecorated gypsum board or water-resistant gypsum backing board complying with the standards listed in Tables 10.6.2, 10.7.2 and SBC 301.

GYPSUM PLASTER. A mixture of calcined gypsum or calcined gypsum and lime and aggregate and other approved materials as specified in this code requirements.

GYPSUM VENEER PLASTER. Gypsum plaster applied to an approved base in one or more coats normally not exceeding 6.4 mm in total thickness.

INTERIOR SURFACES. Surfaces other than weather-exposed surfaces.

WEATHER-EXPOSED SURFACES. Surfaces of walls, ceilings, floors, roofs, soffits and similar surfaces exposed to the weather except the following:

1. Ceilings and roof soffits enclosed by walls, fascia, bulkheads or beams that extend a minimum of 300 mm below such ceiling or roof soffits.
2. Walls or portions of walls beneath an unenclosed roof area, where located a horizontal distance from an open exterior opening equal to at least twice the height of the opening.
3. Ceiling and roof soffits located a minimum horizontal distance of 3000 mm from the outer edges of the ceiling or roof soffits.

WIRE BACKING. Horizontal strands of tautened wire attached to surfaces of vertical supports which, when covered with the building paper, provide a backing for cement plaster.

SECTION 10.3
INSPECTION

10.3.1 **Inspection.** Lath and gypsum board shall be inspected in accordance with SBC 100.

SECTION 10.4
VERTICAL AND HORIZONTAL ASSEMBLIES

10.4.1 **Scope.** The following requirements shall be met where construction involves gypsum board, lath and plaster in vertical and horizontal assemblies.

10.4.1.1 **Wood framing.** Wood supports for lath or gypsum board, as well as wood stripping or furring, shall not be less than 50 mm nominal thickness in the least dimension.

Exception: The minimum nominal dimension of wood furring strips installed over solid backing shall not be less than 25 mm by 51 mm.

10.4.1.2 **Studless partitions.** The minimum thickness of vertically erected studless solid plaster partitions of 9.5 mm and 19.1 mm rib metal lath or 12.7 mm thick long-length gypsum lath and gypsum board partitions shall be 50 mm.

SECTION 10.5
SHEAR WALL CONSTRUCTION

10.5.1 **Resistance to shear (wood framing).** Wood-framed shear walls sheathed with gypsum board, lath and plaster shall be designed and constructed in accordance with an approved method and are permitted to resist wind and seismic loads. Walls resisting seismic loads shall be subject to the limitations in SBC 301.

10.5.2 **Resistance to shear (steel framing).** Cold-formed steel framed shear walls sheathed with gypsum board and constructed in accordance with the materials and provisions of SBC 306 are permitted to resist wind and seismic loads. Walls resisting seismic loads shall be subject to the limitations in SBC 301.

SECTION 10.6
GYPSUM BOARD MATERIALS

10.6.1 **General.** Gypsum board materials and accessories shall be identified by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored to protect such materials from the weather.

10.6.2 **Standards.** Gypsum board materials shall conform to the appropriate standards listed in Table 10.6.2 and, where required for fire protection, shall conform to the provisions of SBC 801.

10.6.2.1 **Other materials.** Metal suspension systems for acoustical and lay-in panel ceilings shall conform with ASTM C 635 and Section 9.6.2.6 of ASCE 7 for installation in high seismic areas.

TABLE 10.6.2
GYPSUM BOARD MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum board	ASTM C 1047
Gypsum sheathing	ASTM C 79
Gypsum wallboard	ASTM C 36
Joint reinforcing tape and compound	ASTM C 474; C 475
Nails for gypsum boards	ASTM C 514, F 547, F 1667
Steel screws	ASTM C 954; C 1002
Steel studs, nonload bearing	ASTM C 645
Steel studs, load bearing	ASTM C 955
Water-resistant gypsum backing board	ASTM C 630
Exterior soffit board	ASTM C 931
Fiber-reinforced gypsum panels	ASTM C 1278
Gypsum backing board and gypsum shaftliner board	ASTM C 442
Gypsum ceiling board	ASTM C 1395
Standard specification for gypsum board	ASTM C 1396
Predecorated gypsum board	ASTM C 960
Adhesives for fastening gypsum wallboard	ASTM C 557
Testing gypsum and gypsum products	ASTM C 22; C 472; C 473
Glass mat gypsum substrate	ASTM C 1177
Glass mat gypsum backing panel	ASTM C 1178

SECTION 10.7
LATHING AND PLASTERING

10.7.1 **General.** Lathing and plastering materials and accessories shall be marked by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored in such a manner to protect them from the weather.

10.7.2 **Standards.** Lathing and plastering materials shall conform to the standards listed in Table 10.7.2 and Chapter 17 and, where required for fire protection, shall also conform to the provisions of Chapter 7.

TABLE 10.7.2
LATH, PLASTERING MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum veneer base	ASTM C 1047
Exterior plaster bonding compounds	ASTM C 932
Gypsum base for veneer plasters	ASTM C 588
Gypsum casting and molding plaster	ASTM C 59
Gypsum Keene's cement	ASTM C 61
Gypsum lath	ASTM C 37
Gypsum plaster	ASTM C 28
Gypsum veneer plaster	ASTM C 587
Interior bonding compounds, gypsum	ASTM C 631
Lime plasters	ASTM C 5; C 206
Masonry cement	ASTM C 91
Metal lath	ASTM C 847
Plaster aggregates	
Sand	ASTM C 35; C 897
Perlite	ASTM C 35
Vermiculite	ASTM C 35
Plastic cement	ASTM C 1328
Blended cement	ASTM C 595
Portland cement	ASTM C 150
Steel studs and track	ASTM C 645; C 955
Steel screws	ASTM C 1002; C 954
Welded wire lath	ASTM C 933
Woven wire plaster base	ASTM C 1032

SECTION 10.8
GYPSUM CONSTRUCTION

10.8.1 **General.** Gypsum board and gypsum plaster construction shall be of the materials listed in Tables 10.6.2 and 10.7.2. These materials shall be assembled and installed in compliance with the appropriate standards listed in Tables 10.8.1 and 10.11.1, and Chapter 17.

10.8.2 **Limitations.** Gypsum wallboard or gypsum plaster shall not be used in any exterior surface where such gypsum construction will be exposed directly to the weather. Gypsum wallboard shall not be used where there will be direct exposure to water or continuous high humidity conditions. Gypsum sheathing shall be installed on exterior surfaces in accordance with ASTM C 1280.

TABLE 10.8.1
INSTALLATION OF GYPSUM CONSTRUCTION

MATERIAL	STANDARD
Gypsum sheathing	ASTM C 1280
Gypsum veneer base	ASTM C 844
Gypsum board	GA-216; ASTM C 840
Interior lathing and furring	ASTM C 841
Steel framing for gypsum boards	ASTM C 754; C 1007

10.8.2.1 **Weather protection.** Gypsum wallboard, gypsum lath or gypsum plaster shall not be installed until weather protection for the installation is provided.

10.8.3 **Single-ply application.** Edges and ends of gypsum board shall occur on the framing members, except those edges and ends that are perpendicular to the framing members. Edges and ends of gypsum board shall be in moderate contact except in concealed spaces where fire-resistance-rated construction, shear resistance or diaphragm action is not required.

10.8.3.1 **Floating angles.** Fasteners at the top and bottom plates of vertical assemblies, or the edges and ends of horizontal assemblies perpendicular to supports, and at the wall line are permitted to be omitted except on shear resisting elements or fire-resistance-rated assemblies. Fasteners shall be applied in such a manner as not to fracture the face paper with the fastener head.

10.8.4 **Joint treatment.** Gypsum board fire-resistance-rated assemblies shall have joints and fasteners treated.

Exception: Joint and fastener treatment need not be provided where any of the following conditions occur:

1. Where the gypsum board is to receive a decorative finish such as wood paneling, battens, acoustical finishes or any similar application that would be equivalent to joint treatment.
2. On single-layer systems where joints occur over wood framing members.
3. Square edge or tongue-and-groove edge gypsum board (V-edge), gypsum backing board or gypsum sheathing.
4. On multilayer systems where the joints of adjacent layers are offset from one to another.
5. Assemblies tested without joint treatment.

10.8.5 **Horizontal gypsum board diaphragm ceilings.** Gypsum board shall be permitted to be used on wood joists to create a horizontal diaphragm ceiling in accordance with Table 10.8.5.

10.8.5.1 **Diaphragm proportions.** The maximum allowable diaphragm proportions shall be $1^1/_2$:1 between shear resisting elements. Rotation or cantilever conditions shall not be permitted.

10.8.5.2 **Installation.** Gypsum board used in a horizontal diaphragm ceiling shall be installed perpendicular to ceiling framing members. End joints of adjacent courses of gypsum board shall not occur on the same joist.

TABLE 10.8.5
SHEAR CAPACITY FOR HORIZONTAL WOOD FRAMED GYPSUM BOARD DIAPHRAGM CEILING ASSEMBLIES

MATERIAL	THICKNESS OF MATERIAL (MINIMUM) (mm)	SPACING OF FRAMING MEMBERS (MAXIMUM) (mm)	SHEAR VALUE [a,b] (plf of ceiling)	MIMIMUM FASTENER SIZE (mm)
Gypsum board	12.7	400 o.c.	90	5d cooler or wallboard nail; 40mm long; 2mm shank; – 6mm head[c]
Gypsum board	12.7	400 o.c.	70	5d cooler or wallboard nail; 40mm long; 2mm shank; 6mm head[c]

a. Values are not cumulative with other horizontal diaphragm values and are for short-term loading due to wind or seismic loading. Values shall be reduced 25 percent for normal loading.
b. Values shall be reduced 50 percent in Seismic Categories D, E and F.
c. No. 6 Type S or W screws are permitted to be substituted for the listed nails.

10.8.5.3 **Blocking of perimeter edges.** All perimeter edges shall be blocked using a wood member not less than 50 mm by 160 nominal dimensions. Blocking material shall be installed flat over the top plate of the wall to provide a nailing surface not less than 50 mm in width for the attachment of the gypsum board.

10.8.5.4 **Fasteners.** Fasteners used for the attachment of gypsum board to a horizontal diaphragm ceiling shall be as defined in Table 10.8.5. Fasteners shall be spaced not more than 178 mm on center (o.c.) at all supports, including perimeter blocking, and not more than 9.5 mm from the edges and ends of the gypsum board.

10.8.5.5 **Lateral force restrictions.** Gypsum board shall not be used in diaphragm ceilings to resist lateral forces imposed by masonry or concrete construction.

SECTION 10.9
GYPSUM BOARD IN SHOWERS AND WATER CLOSETS

10.9.1 **Wet areas.** Showers and public toilet walls shall conform to Sections 7.10.2 and 7.10.3.

10.9.2 **Base for tile.** When gypsum board is used as a base for tile or wall panels for tubs, shower or water closet compartment walls, water-resistant gypsum backing board shall be used as a substrate. Regular gypsum wallboard is permitted under tile or wall panels in other wall and ceiling areas when installed in accordance with GA-216 or ASTM C 840.

10.9.3 **Limitations.** Water-resistant gypsum backing board shall not be used in the following locations:

1. Over a vapor retarder in shower or bathtub compartments.
2. Where there will be direct exposure to water or in areas subject to continuous high humidity.
3. On ceilings where frame spacing exceeds 300 mm o.c. for 12.7 mm thick

water-resistant gypsum backing board and more than 406 mm o.c. for 16 mm thick water-resistant gypsum backing board.

SECTION 10.10
LATHING AND FURRING FOR CEMENT PLASTER (STUCCO)

10.10.1 **General.** Exterior and interior cement plaster and lathing shall be done with the appropriate materials listed in Table 10.7.2 and referenced standards.

10.10.2 **Weather protection.** Materials shall be stored in such a manner as to protect such materials from the weather.

10.10.3 **Installation.** Installation of these materials shall be in compliance with ASTM C 926 and ASTM C 1063.

10.10.4 **Corrosion resistance.** Metal lath and lath attachments shall be of corrosion-resistant material.

10.10.5 **Backing.** Backing or a lath shall provide sufficient rigidity to permit plaster applications.

10.10.5.1 **Support of lath.** Where lath on vertical surfaces extends between rafters or other similar projecting members, solid backing shall be installed to provide support for lath and attachments.

10.10.5.2 **Use of gypsum backing board.**

10.10.5.2.1 **Use of gypsum board as a backing board.** Gypsum lath or gypsum wallboard shall not be used as a backing for cement plaster.

Exception: Gypsum lath or gypsum wallboard is permitted, with a weather-resistant barrier, as a backing for self-furred metal lath or self-furred wire fabric lath and cement plaster where either of the following conditions occur:

1. On horizontal supports of ceilings or roof soffits.
2. On interior walls.

10.10.5.2.2 **Use of gypsum sheathing backing.** Gypsum sheathing is permitted as a backing for metal or wire fabric lath and cement plaster on walls. A weather-resistant barrier shall be provided in accordance with Section 10.10.6.

10.10.5.3 **Backing not required.** Wire backing is not required under expanded metal lath or paperbacked wire fabric lath.

10.10.6 **Weather-resistant barriers.** Weather-resistant barriers shall be installed as required in Section 5.4.2 and, where applied over wood-based sheathing, shall include a weather-resistant vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper.

10.10.7 **Preparation of masonry and concrete.** Surfaces shall be clean, free from efflorescence, sufficiently damp and rough for proper bond. If the surface is insufficiently rough, approved bonding agents or a portland cement dash bond coat mixed in proportions of not more than two parts volume of sand to one part volume of portland cement or plastic cement shall be applied. The dash bond coat shall be left undisturbed and shall be moist cured not less than 24 hours.

SECTION 10.11
INTERIOR PLASTER

10.11.1 **General.** Plastering gypsum plaster or cement plaster shall not be less than three coats where applied over metal lath or wire fabric lath and not less than two coats where applied over other bases permitted by this chapter.

Exception: Gypsum veneer plaster and cement plaster specifically designed and approved for one-coat applications.

TABLE 10.11.1
INSTALLATION OF PLASTER CONSTRUCTION

MATERIAL	STANDARD
Gypsum plaster	ASTM C 842
Gypsum veneer plaster	ASTM C 843
Interior lathing and furring (gypsum plaster)	ASTM C 841
Lathing and furring (cement plaster)	ASTM C 1063
Portland cement plaster	ASTM C 926
Steel framing	ASTM C 754; C 1007

10.11.1.1 **Installation.** Installation of lathing and plaster materials shall conform with Table 10.11.1 and Section 10.7.

10.11.2 **Limitations.** Plaster shall not be applied directly to fiber insulation board. Cement plaster shall not be applied directly to gypsum lath or gypsum plaster except as specified in Sections 10.10.5.1 and 10.10.5.2.

10.11.3 **Grounds.** Where installed, grounds shall ensure the minimum thickness of plaster as set forth in ASTM C 842 and ASTM C 926. Plaster thickness shall be measured from the face of lath and other bases.

10.11.4 **Interior masonry or concrete.** Condition of surfaces shall be as specified in Section 10.10.7. Approved specially prepared gypsum plaster designed for application to concrete surfaces or approved acoustical plaster is permitted. The total thickness of base coat plaster applied to concrete ceilings shall be as set forth in ASTM C 842 or ASTM C 926. Should ceiling surfaces require more than the maximum thickness permitted in ASTM C 842 or ASTM C 926, metal lath or wire fabric lath shall be installed on such surfaces before plastering.

10.11.5 **Wet areas.** Showers and public toilet walls shall conform to Sections 7.10.2 and 7.10.3. When wood frame walls and partitions are covered on the interior with cement plaster or tile of similar material and are subject to water splash, the framing shall be protected with an approved moisture barrier.

SECTION 10.12
EXTERIOR PLASTER

10.12.1 **General.** Plastering with cement plaster shall not be less than three coats where applied over metal lath or wire fabric lath and not less than two coats where applied over masonry, concrete or gypsum board backing as specified in Section 10.10.5. If the plaster surface is to be completely covered by veneer or other facing

material, or is completely concealed by another wall, plaster application need be only two coats, provided the total thickness is as set forth in ASTM C 926.

10.12.1.1 **On-grade floor slab.** On wood framed or steel stud construction with an on-grade concrete floor slab system, exterior plaster shall be applied in such a manner as to cover, but not to extend below, the lath and paper. The application of lath, paper and flashing or drip screeds shall comply with ASTM C 1063.

10.12.1.2 **Weep screeds.** A minimum 0.5 mm (No. 26 galvanized sheet gage), corrosion-resistant weep screed with a minimum vertical attachment flange of 90 mm shall be provided at or below the foundation plate line on exterior stud walls in accordance with ASTM C 926. The weep screed shall be placed a minimum of 102 mm above the earth or 50 mm above paved areas and be of a type that will allow trapped water to drain to the exterior of the building. The weather-resistant barrier shall lap the attachment flange. The exterior lath shall cover and terminate on the attachment flange of the weep screed.

10.12.2 **Plasticity agents.** Only approved plasticity agents and approved amounts thereof shall be added to portland cement. When plastic cement or masonry cement is used, no additional lime or plasticizers shall be added. Hydrated lime or the equivalent amount of lime putty used as a plasticizer is permitted to be added to cement plaster or cement and lime plaster in an amount not to exceed that set forth in ASTM C 926.

10.12.3 **Limitations.** Gypsum plaster shall not be used on exterior surfaces.

10.12.4 **Cement plaster.** Plaster coats shall be protected from freezing for a period of not less than 24 hours after set has occurred. Plaster shall be applied when the ambient temperature is higher than 4°C, unless provisions are made to keep cement plaster work above 4°C during application and 48 hours thereafter.

10.12.5 **Second-coat application.** The second coat shall be brought out to proper thickness, rodded and floated sufficiently rough to provide adequate bond for the finish coat. The second coat shall have no variation greater than 6.4 mm in any direction under a 1525 mm straight edge.

10.12.6 **Curing and interval.** First and second coats of cement plaster shall be applied and moist cured as set forth in ASTM C 926 and Table 10.12.6.

TABLE 10.12.6
CEMENT PLASTERS [a]

COAT	MINIMUM PERIOD MOIST CURING	MINIMUM INTERVAL BETWEEN COATS
First	48 hours[a]	48 hours[b]
Second	48 hours	7 days[c]
Finish	—	Note [c]

a. The first two coats shall be as required for the first coats of exterior plaster, except that the moist-curing time period between the first and second coats shall not be less than 24 hours. Moist curing shall not be required where job and weather conditions are favorable to the retention of moisture in the cement plaster for the required time period.
b. Twenty-four-hour minimum interval between coats of interior cement plaster. For alternate method of application, see Section 10.12.8.
c. Finish coat plaster is permitted to be applied to interior portland cement base coats after a 48-hour period.

10.12.7 Application to solid backings. Where applied over gypsum backing as specified in Section 10.10.5 or directly to unit masonry surfaces, the second coat is permitted to be applied as soon as the first coat has attained sufficient hardness.

10.12.8 Alternate method of application. The second coat is permitted to be applied as soon as the first coat has attained sufficiently rigidity to receive the second coat.

10.12.8.1 Admixtures. When using this method of application, calcium aluminate cement up to 15 percent of the weight of the portland cement is permitted to be added to the mix.

10.12.8.2 Curing. Curing of the first coat is permitted to be omitted and the second coat shall be cured as set forth in ASTM C 926 and Table 10.12.6.

10.12.9 Finish coats. Cement plaster finish coats shall be applied over base coats that have been in place for the time periods set forth in ASTM C 926. The third or finish coat shall be applied with sufficient material and pressure to bond and to cover the brown coat and shall be of sufficient thickness to conceal the brown coat.

SECTION 10.13
EXPOSED AGGREGATE PLASTER

10.13.1 General. Exposed natural or integrally colored aggregate is permitted to be partially embedded in a natural or colored bedding coat of cement plaster or gypsum plaster, subject to the provisions of this section.

10.13.2 Aggregate. The aggregate shall be applied manually or mechanically and shall consist of marble chips, pebbles or similar durable, moderately hard (three or more on the Mohs hardness scale), non-reactive materials.

10.13.3 Bedding coat proportions. The bedding coat for interior or exterior surfaces shall be composed of one-part portland cement, one-part Type S lime and a maximum of three parts of graded white or natural sand by volume. The bedding coat for interior surfaces shall be composed of 45.4 kg of neat gypsum plaster and a maximum of 90.8 kg of graded white sand. A factory-prepared bedding coat for interior or exterior use is permitted. The bedding coat for exterior surfaces shall have a minimum compressive strength of 6895 kPa.

10.13.4 Application. The bedding coat is permitted to be applied directly over the first (scratch) coat of plaster, provided the ultimate overall thickness is a minimum of 22 mm, including lath. Over concrete or masonry surfaces, the overall thickness shall be a minimum of 12.7 mm.

10.13.5 Bases. Exposed aggregate plaster is permitted to be applied over concrete, masonry, cement plaster base coats or gypsum plaster base coats installed in accordance with Section 10.11 or 10.12.

10.13.6 Preparation of masonry and concrete. Masonry and concrete surfaces shall be prepared in accordance with the provisions of Section 10.10.7.

10.13.7 Curing of base coats. Cement plaster base coats shall be cured in accordance with ASTM C 926. Cement plaster bedding coats shall retain sufficient moisture for hydration (hardening) for 24 hours minimum or, where necessary, shall be kept damp for 24 hours by light water spraying.

CHAPTER 11
PLASTIC AND GLASS

SECTION 11.1
GENERAL

11.1.1 **Scope.** These provisions shall govern the materials, design, application, construction and installation of foam plastic, foam plastic insulation, plastic veneer, interior plastic finish, trim and light-transmitting plastics, and glass. See Chapter 5 for requirements for exterior wall finish and trim. For glass and glazing, see Sections 11.12-11.20.

SECTION 11.2
DEFINITIONS

11.2.1 **General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the meanings shown herein.

FOAM PLASTIC INSULATION. A plastic that is intentionally expanded by the use of a foaming agent to produce a reduced-density plastic containing voids consisting of open or closed cells distributed throughout the plastic for thermal insulating or acoustical purposes and that has a density less than 320 kg/m^3.

LIGHT-DIFFUSING SYSTEM. Construction consisting in whole or in part of lenses, panels, grids or baffles made with light-transmitting plastics positioned below independently mounted electrical light sources, skylights or light-transmitting plastic roof panels. Lenses, panels, grids and baffles that are part of an electrical fixture shall not be considered as a light-diffusing system.

LIGHT-TRANSMITTING PLASTIC ROOF PANELS. Structural plastic panels other than skylights that are fastened to structural members, or panels or sheathing and that are used as light-transmitting media in the plane of the roof.

LIGHT-TRANSMITTING PLASTIC WALL PANELS. Plastic materials that are fastened to structural members, or to structural panels or sheathing, and that are used as light-transmitting media in exterior walls.

PLASTIC, APPROVED. Any thermoplastic, thermosetting or reinforced thermosetting plastic material that conforms to combustibility classifications specified in the section applicable to the application and plastic type.

PLASTIC GLAZING. Plastic materials that are glazed or set in frame or sash and not held by mechanical fasteners that pass through the glazing material.

REINFORCED PLASTIC, GLASS FIBER. Plastic reinforced with glass fiber having not less than 20 percent of glass fibers by weight.

THERMOPLASTIC MATERIAL. A plastic material that is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

THERMOSETTING MATERIAL. A plastic material that is capable of being changed into a substantially nonreformable product when cured.

SECTION 11.3
FOAM PLASTIC INSULATION

11.3.1 **General.** The provisions of this section shall govern the requirements and uses of foam plastic insulation in buildings and structures.

11.3.2 **Labeling and identification.** Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the label of an approved agency showing the manufacturer's name, the product listing, product identification and information sufficient to determine that the end use will comply with these code requirements.

11.3.3 **Surface-burning characteristics.** Unless otherwise indicated in this section, foam plastic insulation and foam plastic cores of manufactured assemblies shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested in the maximum thickness intended for use in accordance with ASTM E 84. Loose fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

Exceptions:

1. Smoke-developed index for interior trim as provided for in Section 11.4.2.

2. In cold storage buildings, ice plants, food plants, food processing rooms and similar areas, foam plastic insulation where tested in a thickness of 100 mm shall be permitted in a thickness up to 254 mm where the building is equipped throughout with an automatic fire sprinkler system in accordance with SBC 801. The approved automatic sprinkler system shall be provided in both the room and that part of the building in which the room is located.

3. Foam plastic insulation that is a part of a Class A, B or C roof-covering assembly provided the assembly with the foam plastic insulation satisfactorily passes FM 4450 or UL 1256. The smoke-developed index shall not be limited for roof applications.

4. Foam plastic insulation greater than 100 mm in thickness shall have a maximum flame spread index of 75 and a smoke-developed index of 450 where tested at a minimum thickness of 100 mm, provided the end use is approved in accordance with Section 11.3.8 using the thickness and density intended for use.

5. Flame spread and smoke-developed indexes for foam plastic interior signs in covered mall buildings provided the signs comply with Section 2.15.14.

11.3.4 **Thermal barrier.** Except as provided for in Sections 11.3.4.1 and 11.3.8, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 12.7 mm gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 120°C after 15 minutes of fire exposure, complying with the standard time-temperature curve of ASTM E 119. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on FM 4880, UL 1040, NFPA 286 or UL 1715. Combustible concealed spaces shall comply with SBC 801.

11.3.4.1 **Thermal barrier not required.** The thermal barrier specified in Section 11.3.4 is not required under the conditions set forth in Sections 11.3.4.1.1 through

11.3.4.1.13.

11.3.4.1.1 **Masonry or concrete construction.** In a masonry or concrete wall, floor or roof system where the foam plastic insulation is covered on each face by a minimum of 25 mm thickness of masonry or concrete.

11.3.4.1.2 **Cooler and freezer walls.** Foam plastic installed in a maximum thickness of 254 mm in cooler and freezer walls shall:

1. Have a flame spread index of 25 or less and a smoke-developed index of not more than 450, where tested in a minimum 102 mm thickness.
2. Have flash ignition and self-ignition temperatures of not less than 316°C and 427°C, respectively.
3. Have a covering of not less than 0.8 mm aluminum or corrosion-resistant steel having a base metal thickness not less than 0.4 mm at any point.
4. Be protected by an automatic sprinkler system. Where the cooler or freezer is within a building, both the cooler or freezer and that part of the building in which it is located shall be sprinklered.

11.3.4.1.3 **Walk-in coolers.** In nonsprinklered buildings, foam plastic having a thickness that does not exceed 100 mm and a maximum flame spread index of 75 is permitted in walk-in coolers or freezer units where the aggregate floor area does not exceed 37 m^2 and the foam plastic is covered by a metal facing not less than 0.80 mm thick aluminum or corrosion-resistant steel having a minimum base metal thickness of 0.40 mm. A thickness of up to 250 mm is permitted where protected by a thermal barrier.

11.3.4.1.4 **Exterior walls—one-story buildings.** For one-story buildings, foam plastic having a flame spread index of 25 or less, and a smoke-developed index of not more than 450, shall be permitted without thermal barriers in or on exterior walls in a thickness not more than 100mm where the foam plastic is covered by a thickness of not less than 0.80 mm thick aluminum or corrosion-resistant steel having a base metal thickness of 0.40 mm and the building is equipped throughout with an automatic sprinkler system in accordance with SBC 801.

11.3.4.1.5 **Roofing.** Foam plastic insulation under a roof assembly or roof covering that is installed in accordance with the code requirements and the manufacturer's instructions shall be separated from the interior of the building by wood structural panel sheathing not less than 12 mm in thickness bonded with exterior glue, with edges supported by blocking, tongue-and-groove joints or other approved type of edge support, or an equivalent material. A thermal barrier is not required for foam plastic insulation that is a part of a Class A, B or C roof-covering assembly, provided the assembly with the foam plastic insulation satisfactorily passes FM 4450 or UL 1256.

11.3.4.1.6 **Attics and crawl spaces.** Within an attic or crawl space where entry is made only for service of utilities, foam plastic insulation shall be protected against ignition by 38 mm thick mineral fiber insulation; 6.4 mm thick wood structural panel, particleboard or hardboard; 9.5 mm gypsum wallboard, corrosion-resistant steel having a base metal thickness of 0.40 mm or other approved material installed in such a manner that the foam plastic insulation is not exposed. The protective covering shall be consistent with the requirements for the type of construction.

11.3.4.1.7 **Doors not required to have a fire protection rating.** Where pivoted or side-hinged doors are permitted without a fire protection rating, foam plastic insulation, having a flame spread index of 75 or less and a smoke-developed index of not more than 450, shall be permitted as a core material where the door facing is of metal having a minimum thickness of 0.8 mm aluminum or steel having a base metal thickness of not less than 0.40 mm at any point.

11.3.4.1.8 Exterior doors in buildings of Group R-2 or R-3. In occupancies classified as Group R-2 or R-3 as applicable in SBC 100, foam-filled exterior entrance doors to individual dwelling units that do not require a fire-resistance rating shall be faced with wood or other approved materials.

11.3.4.1.9 Garage doors. Where garage doors are permitted without a fire-resistance rating and foam plastic is used as a core material, the door facing shall be metal having a minimum thickness of 0.8 mm aluminum or 0.25 mm steel or the facing shall be minimum 3.2 mm wood. Garage doors having facings other than those described above shall be tested in accordance with, and meet the acceptance criteria of DASMA 107.

Exception: Garage doors using foam plastic insulation complying with Section 11.3.3 in detached and attached garages associated with one- and two-family dwellings need not be provided with a thermal barrier.

11.3.4.1.10 Siding backer board. Foam plastic insulation of not more than 22.7 mJ/m^2 as determined by NFPA 259 shall be permitted as a siding backer board with a maximum thickness of 12.7 mm, provided it is separated from the interior of the building by not less than 50 mm of mineral fiber insulation or equivalent or where applied as insulation with residing over existing wall construction.

11.3.4.1.11 Interior trim. Foam plastic used as interior trim in accordance with Section 11.4 shall be permitted without a thermal barrier.

11.3.4.1.12 Interior signs. Foam plastic used for interior signs in covered mall buildings in accordance with Section 2.15.14 shall be permitted without a thermal barrier.

11.3.4.1.13 Type V construction. Foam plastic spray applied to a sill plate and header of Type V construction is subject to all of the following:

1. The maximum thickness of the foam plastic shall be 82.6 mm.
2. The density of the foam plastic shall be in the range of 24 to 32 kg/m^3.
3. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke-developed index of 450 or less when tested in accordance with ASTM E84.

11.3.5 Exterior walls of buildings of any height. Exterior walls of buildings of Type I, II, III or IV construction of any height shall comply with Sections 11.3.5.1 through 11.3.5.7. Exterior walls of cold storage buildings required to be constructed of noncombustible materials, where the building is more than one story in height, shall also comply with the provisions of Sections 11.3.5.1 through 11.3.5.7. Exterior walls of buildings of Type V construction shall comply with Sections 11.3.2, 11.3.3 and 11.3.4.

11.3.5.1 Fire-resistance-rated walls. Where the wall is required to have a fire-resistance rating, data based on tests conducted in accordance with ASTM E 119 shall be provided to substantiate that the fire-resistance rating is maintained.

11.3.5.2 Thermal barrier. Any foam plastic insulation shall be separated from the building interior by a thermal barrier meeting the provisions of Section 11.3.4, unless special approval is obtained on the basis of Section 11.3.8.

Exception: One-story buildings complying with Section 11.3.4.1.4.

11.3.5.3 Potential heat. The potential heat of foam plastic insulation in any portion of the wall or panel shall not exceed the potential heat expressed in mJ/m^2 of the foam plastic insulation contained in the wall assembly tested in accordance with Section 11.3.5.5. The potential heat of the foam plastic insulation shall be determined by tests conducted in accordance with NFPA 259 and the results shall be expressed in mJ/m^2.

Exception: One-story buildings complying with Section 11.3.4.1.4.

11.3.5.4 **Flame spread and smoke-developed indexes.** Foam plastic insulation, exterior coatings and facings shall be tested separately in the thickness intended for use, but not to exceed 100mm, and shall each have a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E 84.

Exception: Prefabricated or factory-manufactured panels having minimum 0.5 mm aluminum facings and a total thickness of 6.4 mm or less are permitted to be tested as an assembly where the foam plastic core is not exposed in the course of construction.

11.3.5.5 Test standard. The wall assembly shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.

Exception: One-story buildings complying with Section 11.3.4.1.4.

11.3.5.6 **Label required.** The edge or face of each piece of foam plastic insulation shall bear the label of an approved agency. The label shall contain the manufacturer's or distributor's identification, model number, serial number or definitive information describing the product or materials' performance characteristics and approved agency's identification.

11.3.5.7 **Ignition.** Exterior walls shall not exhibit sustained flaming where tested in accordance with NFPA 268. Where a material is intended to be installed in more than one thickness, tests of the minimum and maximum thickness intended for use shall be performed.

Exception: Assemblies protected on the outside with one of the following:

1. A thermal barrier complying with Section 1.3.4.
2. A minimum 25 mm thickness of concrete or masonry.
3. Glass-fiber-reinforced concrete panels of a minimum thickness of 9.5 mm.
4. Metal-faced panels having minimum 0.48 mm thick aluminum or 0.40 mm thick corrosion-resistant steel outer facings.
5. A minimum 22.0 mm thickness of stucco complying with Section 10.10.

11.3.6 **Roofing.** Foam plastic insulation meeting the requirements of Sections 11.3.2, 11.3.3 and 11.3.4 shall be permitted as part of a roof-covering assembly, provided the assembly with the foam plastic insulation is a Class A, B or C roofing assembly where tested in accordance with ASTM E 108 or UL 790.

11.3.7 **Plenums.** Foam plastic insulation shall not be used as interior wall or ceiling finish in plenums except as permitted in Section 11.4 or when protected by a thermal barrier in accordance with Section 11.3.4.

11.3.8 **Special approval.** Foam plastic shall not be required to comply with the requirements of Sections 11.3.4 through 11.3.7, where specifically approved based on large-scale tests such as, but not limited to, FM 4880, UL 1040, NFPA 286 or UL 1715. Such testing shall be related to the actual end-use configuration and be performed on the finished manufactured foam plastic assembly in the maximum thickness intended for use. Foam plastics that are used as interior finish on the basis of special tests shall also conform to the flame spread requirements of Chapter 7. Assemblies tested shall include seams, joints and other typical details used in the installation of the assembly and shall be tested in the manner intended for use.

SECTION 11.4
INTERIOR FINISH AND TRIM

11.4.1 **General.** Plastic materials installed as interior finish or trim shall comply with Chapter 8. Foam plastics shall only be installed as interior finish where approved in accordance with the special provisions of Section 11.3.8. Foam plastics that are used as interior finish shall also meet the flame spread index requirements for interior finish in accordance with Chapter 8. Foam plastics installed as interior trim shall comply with Section 11.4.2.

11.4.2 **Interior trim.** Foam plastic used as interior trim shall comply with Sections 11.4.2.1 through 11.4.2.4.

11.4.2.1 **Density.** The minimum density of the interior trim shall be 320 kg/m^3.

11.4.2.2 **Thickness.** The maximum thickness of the interior trim shall be 12.7 mm and the maximum width shall be 200 mm.

11.4.2.3 **Area limitation.** The interior trim shall not constitute more than 10 percent of the aggregate wall and ceiling area of any room or space.

11.4.2.4 **Flame spread.** The flame spread index shall not exceed 75 where tested in accordance with ASTM E 84. The smoke-developed index shall not be limited.

SECTION 11.5
PLASTIC VENEER

11.5.1 **Interior use.** Where used within a building, plastic veneer shall comply with the interior finish requirements of Chapter 7.

11.5.2 **Exterior use.** Exterior plastic veneer shall be permitted to be installed on the exterior walls of buildings of any type of construction in accordance with all of the following requirements:

1. Plastic veneer shall comply with Section 11.6.4.
2. Plastic veneer shall not be attached to any exterior wall to a height greater than 15.2 meters above grade.
3. Sections of plastic veneer shall not exceed 27.9 m^2 in area and shall be separated by a minimum of 1.2 meters vertically.

Exception: The area and separation requirements and the smoke-density limitation are not applicable to plastic veneer applied to buildings constructed of Type VB construction, provided the walls are not required to have a fire-resistance rating.

SECTION 11.6
LIGHT-TRANSMITTING PLASTICS

11.6.1 **General.** The provisions of this section and Sections 11.7 through 11.11 shall govern the quality and methods of application of light-transmitting plastics for use as light-transmitting materials in buildings and structures. Foam plastics shall comply with Section 11.3. Light-transmitting plastic materials that meet the other code requirements for walls and roofs shall be permitted to be used in accordance with the other applicable code requirements.

11.6.2 **Approval for use.** Sufficient technical data shall be submitted to substantiate the proposed use of any light-transmitting material, as approved by the local building official and subject to the requirements of this section.

11.6.3 Identification. Each unit or package of light-transmitting plastic shall be identified with a mark or decal satisfactory to the building official, which includes identification as to the material classification.

11.6.4 Specifications. Light-transmitting plastics, including thermoplastic, thermosetting or reinforced thermosetting plastic material, shall have a self-ignition temperature of 343°C or greater where tested in accordance with ASTM D 1929; a smoke-developed index not greater than 450 where tested in the manner intended for use in accordance with ASTM E 84, or not greater than 75 where tested in the thickness intended for use in accordance with ASTM D 2843 and shall conform to one of the following combustibility classifications:

Class CC1: Plastic materials that have a burning extent of 25 mm or less where tested at a nominal thickness of 1.5 mm, or in the thickness intended for use, in accordance with ASTM D 635,

Class CC2: Plastic materials that have a burning rate of 1.06 mm/s or less where tested at a nominal thickness of 1.5 mm, or in the thickness intended for use, in accordance with ASTM D 635.

11.6.5 Structural requirements. Light-transmitting plastic materials in their assembly shall be of adequate strength and durability to withstand the loads indicated in SBC 301. Technical data shall be submitted to establish stresses, maximum unsupported spans and such other information for the various thicknesses and forms used as deemed necessary by the building official.

11.6.6 Fastening. Fastening shall be adequate to withstand the loads in SBC 301. Proper allowance shall be made for expansion and contraction of light-transmitting plastic materials in accordance with accepted data on the coefficient of expansion of the material and other material in conjunction with which it is employed.

11.6.7 Light-diffusing systems. Unless the building is equipped throughout with an automatic sprinkler system in accordance with SBC 801, light-diffusing systems shall not be installed in the following occupancies and locations:

1. Group A with an occupant load of 1,000 or more.
2. Theaters with a stage and proscenium opening and an occupant load of 700 or more.
3. Group I-2.
4. Group I-3.
5. Exit stairways and exit passageways.

11.6.7.1 Support. Light-transmitting plastic diffusers shall be supported directly or indirectly from ceiling or roof construction by use of noncombustible hangers. Hangers shall be at least No. 12 steel-wire gage galvanized wire or equivalent.

11.6.7.2 Installation. Light-transmitting plastic diffusers shall comply with Chapter 7 unless the light-transmitting plastic diffusers will fall from the mountings before igniting, at an ambient temperature of at least 93°C below the ignition temperature of the panels. The panels shall remain in place at an ambient room temperature of 79°C for a period of not less than 15 minutes.

11.6.7.3 Size limitations. Individual panels or units shall not exceed 3 meters in length nor 2.79 m^2 in area.

11.6.7.4 Fire suppression system. In buildings that are equipped throughout with an automatic sprinkler system in accordance with SBC 801, plastic light-diffusing systems shall be protected both above and below unless the sprinkler system has been specifically approved for installation only above the light-diffusing system.

Areas of light-diffusing systems that are protected in accordance with this section shall not be limited.

11.6.7.5 **Electrical lighting fixtures.** Light-transmitting plastic panels and light-diffuser panels that are installed in approved electrical lighting fixtures shall comply with the requirements of Chapter 7 unless the light-transmitting plastic panels conform to the requirements of Section 11.6.7.2. The area of approved light-transmitting plastic materials that are used in required exits or corridors shall not exceed 30 percent of the aggregate area of the ceiling in which such panels are installed, unless the building is equipped throughout with an automatic sprinkler system in accordance with SBC 801.

11.6.8 **Partitions.** Light-transmitting plastics used in or as partitions shall comply with the requirements of Chapters 4 and 7.

11.6.9 **Bathroom accessories.** Light-transmitting plastics shall be permitted as glazing in shower stalls, shower doors, bathtub enclosures and similar accessory units. Safety glazing shall be provided in accordance with Sections 11.12 - 11.20.

11.6.10 **Awnings, patio covers and similar structures.** Awnings constructed of light-transmitting plastics shall be constructed in accordance with provisions specified in Section 4.4.5 and Chapter 5 for projections and appendages. Patio covers constructed of light-transmitting plastics shall comply with Section 11.6. Light-transmitting plastics used in canopies at motor fuel-dispensing facilities shall comply with Section 11.6 except as modified by Section 2.19.5.2.

11.6.11 **Greenhouses.** Light-transmitting plastics shall be permitted in lieu of plain glass in greenhouses.

11.6.12 **Solar collectors.** Light-transmitting plastic covers on solar collectors having noncombustible sides and bottoms shall be permitted on buildings not over three stories in height or 836 m^2 in total floor area, provided the light-transmitting plastic cover does not exceed 33.33 percent of the roof area for CC1 materials or 25 percent of the roof area for CC2 materials.

Exception: Light-transmitting plastic covers having a thickness of 0.3 mm or less or shall be permitted to be of any plastic material provided the area of the solar collectors does not exceed 33.33 percent of the roof area.

SECTION 11.7
LIGHT-TRANSMITTING PLASTIC WALL PANELS

11.7.1 **General.** Light-transmitting plastics shall not be used as wall panels in exterior walls in occupancies in Groups A-l, A-2, H, I-2 and I-3. In other groups, light-transmitting plastics shall be permitted to be used as wall panels in exterior walls, provided that the walls are not required to have a fire-resistance rating and the installation conforms to the requirements of this section. Such panels shall be erected and anchored on a foundation, waterproofed or otherwise protected from moisture absorption and sealed with a coat of mastic or other approved waterproof coating. Light-transmitting plastic wall panels shall also comply with Section 11.6.

11.7.2 **Installation.** Exterior wall panels installed as provided for herein shall not alter the type of construction classification of the building.

11.7.3 **Height limitation.** Light-transmitting plastics shall not be installed more than 23 meters above grade plane, except as allowed by Section 11.7.5.

11.7.4 **Area limitation and separation.** The maximum area of a single wall panel and minimum vertical and horizontal separation requirements for exterior light-transmitting plastic wall panels shall be as provided for in Table 11.7.4. The maximum percentage of wall area of any story in light-transmitting plastic wall panels shall not exceed that indicated in Table 11.7.4 or the percentage of unprotected openings permitted by SBC 801, whichever is smaller.

TABLE 11.7.4
AREA LIMITATION AND SEPARATION REQUIREMENTS FOR LIGHT-TRANSMITTING PLASTIC WALL PANELS [a]

FIRE SEPARATION DISTANCE (meters)	CLASS OF PLASTIC	MAXIMUM PERCENTAGE AREA OF EXTERIOR WALL IN PLASTIC WALL PANELS	MAXIMUM SINGLE AREA OF PLASTIC WALL PANELS (square meter)	MINIMUM SEPARATION OF PLASTIC WALL PANELS (meters)	
				Vertical	Horizontal
Less than 1.8	--	Not Permitted	Not Permitted	--	--
1.8 or more but less than 3.4	CC1	10	4.7	2.4	1.2
	CC2	Not Permitted	Not Permitted	--	--
3.4 or more but less than or equal to 9.0	CC1	25	8.0	1.8	1.2
	CC2	15	6.5	2.4	1.2
Over 9.0	CC1	50	Not Limited	0.9[b]	0
	CC2	50	9.3	1.8[b]	0.9

a. For combinations of plastic glazing and plastic wall panel areas permitted, see Section 11.7.6.
b. For reductions in vertical separation allowed, see Section 11.7.4.

11.7.5 **Automatic sprinkler system.** Where the building is equipped throughout with an automatic sprinkler system in accordance with SBC 801, the maximum percentage area of exterior wall in any story in light-transmitting plastic wall panels and the maximum square meters of a single area given in Table 11.7.4 shall be increased 100 percent, but the area of light-transmitting plastic wall panels shall not exceed 50 percent of the wall area in any story, or the area permitted by SBC 801 for unprotected openings, whichever is smaller. These installations shall be exempt from height limitations.

11.7.6 **Combinations of glazing and wall panels.** Combinations of light-transmitting plastic glazing and light-transmitting plastic wall panels shall be subject to the area, height and percentage limitations and the separation requirements applicable to the class of light-transmitting plastic as prescribed for light-transmitting plastic wall panel installations.

Exceptions:

1. In structures provided with approved flame barriers extending 760 mm beyond the exterior wall in the plane of the floor, a vertical separation is not required at the floor except that provided by the vertical thickness of the flame barrier projection. Veneers of approved weather-resistant light-transmitting plastics used as exterior siding in buildings of Type V construction in compliance with Section 5.6.
2. The area of light-transmitting plastic wall panels in exterior walls of greenhouses shall be exempt from the area limitations of Table 11.7.4 but shall be limited as required for unprotected openings in accordance with SBC 801.

SECTION 11.8
LIGHT-TRANSMITTING PLASTIC GLAZING

11.8.1 **Buildings of Type VB construction.** Openings in the exterior walls of buildings of Type VB construction, where not required to be protected by SBC 801, shall be permitted to be glazed or equipped with light-transmitting plastic. Light-transmitting plastic glazing shall also comply with Section 11.6.

11.8.2 **Buildings of other types of construction.** Openings in the exterior walls of buildings of types of construction other than Type VB, where not required to be protected by SBC 801, shall be permitted to be glazed or equipped with light-transmitting plastic in accordance with Section 11.6 and all of the following:

1. The aggregate area of light-transmitting plastic glazing shall not exceed 25 percent of the area of any wall face of the story in which it is installed. The area of a single pane of glazing installed above the first story above grade plane shall not exceed 1.5 m^2 and the vertical dimension of a single pane shall not exceed 1.2 meters.
   Exception: Where an automatic sprinkler system is provided throughout in accordance with SBC 801, the area of allowable glazing shall be increased to a maximum of 50 percent of the wall face of the story in which it is installed with no limit on the maximum dimension or area of a single pane of glazing.
2. Approved flame barriers extending 762 mm beyond the exterior wall in the plane of the floor, or vertical panels not less than 1.2 meters in height, shall be installed between glazed units located in adjacent stories.
   Exception: Buildings equipped throughout with an automatic sprinkler system in accordance with SBC 801.
3. Light-transmitting plastics shall not be installed more than 2.3 meters above grade level.
   Exception: Buildings equipped throughout with an automatic sprinkler system in accordance with Section SBC 801.

SECTION 11.9
LIGHT-TRANSMITTING PLASTIC ROOF PANELS

11.9.1 **General.** Light-transmitting plastic roof panels shall comply with this section and Section 11.6. Light-transmitting plastic roof panels shall not be installed in Groups H, I-2 and I-3. In all other groups, light-transmitting plastic roof panels shall comply with any one of the following conditions:

1. The building is equipped throughout with an automatic sprinkler system in accordance with SBC 801.
2. The roof construction is not required to have a fire-resistance rating by Table 4.1.
3. The roof panels meet the requirements for roof coverings in accordance with Chapter 6.

11.9.2 **Separation.** Individual roof panels shall be separated from each other by a distance of not less than 1.2 meters measured in a horizontal plane.

Exceptions:

1. The separation between roof panels is not required in a building equipped throughout with an automatic sprinkler system in accordance with SBC 801.
2. The separation between roof panels is not required in low-hazard occupancy buildings complying with the conditions of Section 11.9.4, Exception 2 or 3.

11.9.3 **Location.** Where exterior wall openings are required to be protected by SBC 801, a roof panel shall not be installed within 1.8 meters of such exterior wall.

11.9.4 **Area limitations.** Roof panels shall be limited in area and the aggregate area of panels shall be limited by a percentage of the floor area of the room or space sheltered in accordance with Table 11.9.4.

Exceptions:

1. The area limitations of Table 11.9.4 shall be permitted to be increased by 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with SBC 801.
2. Low-hazard occupancy buildings, such as swimming pool shelters, shall be exempt from the area limitations of Table 11.9.4, provided that the buildings do not exceed 465 m^2 in area and have a minimum fire separation distance of 3.0 meters.
3. Greenhouses that are occupied for growing plants on a production or research basis, without public access, shall be exempt from the area limitations of Table 11.9.4 provided they have a minimum fire separation distance of 1.2 meters.
4. Roof coverings over terraces and patios in occupancies in Group R-3 as applicable in Section 8.1.2 shall be exempt from the area limitations of Table 11.9.4 and shall be permitted with light-transmitting plastics.

TABLE 11.9.4
AREA LIMITATIONS FOR LIGHT-TRANSMITTING PLASTIC ROOF PANELS

CLASS OF PLASTIC	MAXIMUM AREA OF INDIVIDUAL ROOF PANELS (square feet)	MAXIMUM AGGREGATE AREA OF ROOF PANELS (percent of floor area)
CC1	28	30
CC2	9.3	25

SECTION 11.10
LIGHT-TRANSMITTING PLASTIC SKYLIGHT GLAZING

11.10.1 **Light-transmitting plastic glazing of skylight assemblies.** Skylight assemblies glazed with light-transmitting plastic shall conform to the provisions of this section and Section 11.6. Unit skylights glazed with light-transmitting plastic shall also comply with Section 11.16.5.

Exception: Skylights in which the light-transmitting plastic conforms to the required roof-covering class in accordance with Section 6.5.

11.10.2 **Mounting.** The light-transmitting plastic shall be mounted above the plane of the roof on a curb constructed in accordance with the requirements for the type of construction classification, but at least 100 mm above the plane of the roof. Edges of light-transmitting plastic skylights or domes shall be protected by metal or other approved noncombustible material, or the light-transmitting plastic dome or skylight shall be shown to be able to resist ignition where exposed at the edge to a flame from a Class B brand as described in ASTM E 108 or UL 790.

Exceptions:

1. Curbs shall not be required for skylights used on roofs having a minimum slope of three units vertical in 12 units horizontal (25 percent slope) in occupancies in Group R-3 as applicable in Section 8.1.2 and on buildings with

a nonclassified roof covering.

2. The metal or noncombustible edge material is not required where nonclassified roof coverings are permitted.

11.10.3 **Slope.** Flat or corrugated light-transmitting plastic skylights shall slope at least four units vertical in 12 units horizontal (4:12). Dome-shaped skylights shall rise above the mounting flange a minimum distance equal to 10 percent of the maximum span of the dome but not less than 76 mm.

Exception: Skylights that pass the Class B Burning Brand Test specified in ASTM E 108 or UL 790.

11.10.4 **Maximum area of skylights.** Each skylight shall have a maximum area within the curb of 9.30 m^2.

Exception: The area limitation shall not apply where the building is equipped throughout with an automatic sprinkler system in accordance with SBC 801 or the building is equipped with smoke and heat vents in accordance with SBC 801.

11.10.5 **Aggregate area of skylights.** The aggregate area of skylights shall not exceed $33^1/_3$ percent of the floor area of the room or space sheltered by the roof in which such skylights are installed where Class CC1 materials are utilized, and 25 percent where Class CC2 materials are utilized.

Exception: The aggregate area limitations of light-transmitting plastic skylights shall be increased 100 percent beyond the limitations set forth in this section where the building is equipped throughout with an automatic sprinkler system in accordance with SBC 801 or the building is equipped with smoke and heat vents in accordance with SBC 801.

11.10.6 **Separation.** Skylights shall be separated from each other by a distance of not less than 1.2 meters measured in a horizontal plane.

Exceptions:

1. Buildings equipped throughout with an automatic sprinkler system in accordance with SBC 801.

2. In Group R-3 as applicable in Section 8.1.2, multiple skylights located above the same room or space with a combined area not exceeding the limits set forth in Section 11.10.4.

11.10.7 **Location.** Where exterior wall openings are required to be protected in accordance with SBC 801, a skylight shall not be installed within 1.8 meters of such exterior wall.

11.10.8 **Combinations of roof panels and skylights.** Combinations of light-transmitting plastic roof panels and skylights shall be subject to the area and percentage limitations and separation requirements applicable to roof panel installations.

SECTION 11.11
LIGHT-TRANSMITTING PLASTIC INTERIOR SIGNS

11.11.1 **General.** Light-transmitting plastic interior wall signs shall be limited as specified in Sections 11.11.2 through 11.11.4. Light-transmitting plastic interior wall signs in covered mall buildings shall comply with Section 2.15.14. Light-transmitting plastic interior signs shall also comply with Section 11.6.

11.11.2 **Aggregate area.** The sign shall not exceed 20 percent of the wall area.

11.11.3 **Maximum area.** The sign shall not exceed 2.23 m^2.

11.11.4 **Encasement.** Edges and backs of the sign shall be fully encased in metal.

SECTION 11.12
GLASS AND GLAZING

11.12.1 **Scope.** The provisions of this chapter shall govern the materials, design, construction and quality of glass, light transmitting ceramic and light-transmitting plastic panels for exterior and interior use in both vertical and sloped applications in buildings and structures.

11.12.2 **Glazing replacement.** The installation of replacement glass shall be as required for new installations.

SECTION 11.13
GLASS AND GLAZING DEFINITIONS

11.13.1 **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

DALLE GLASS. A decorative composite glazing material made of individual pieces of glass that are embedded in a cast matrix of concrete or epoxy.

DECORATIVE GLASS. A carved, leaded or Dalle glass or glazing material whose purpose is decorative or artistic, not functional; whose coloring, texture or other design qualities or components cannot be removed without destroying the glazing material and whose surface, or assembly into which it is incorporated, is divided into segments.

SECTION 11.14
GENERAL REQUIREMENTS FOR GLASS

11.14.1 **Identification.** Each pane shall bear the manufacturer's label designating the type and thickness of the glass or glazing material. The identification shall not be omitted unless approved and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved construction documents that comply with the provisions of this chapter. Safety glazing shall be identified in accordance with Section 11.17.2. Each pane of tempered glass, except tempered spandrel glass, shall be permanently identified by the manufacturer. The identification label shall be acid etched, sand blasted, ceramic fired, embossed or shall be of a type that once applied cannot be removed without being destroyed.
Tempered spandrel glass shall be provided with a removable paper marking by the manufacturer.

11.14.2 **Glass supports.** Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, detailed construction documents, detailed shop drawings and analysis or test data assuring safe performance for the specific installation shall be prepared by a registered design professional.

11.14.3 **Framing.** To be considered firmly supported, the framing members for each

individual pane of glass shall be designed so the deflection of the edge of the glass perpendicular to the glass pane shall not exceed $^{1}/_{175}$ of the glass edge length or 19 mm, whichever is less, when subjected to the larger of the positive or negative load where loads are combined as specified in SBC 301.

11.14.4 **Interior glazed areas.** Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall not be greater than the thickness of the panels when a force of 730 N/m is applied horizontally to one panel at any point up to 1.1 meters above the walking surface.

11.14.5 **Louvered windows or jalousies.** Float, wired and patterned glass in louvered windows and jalousies shall be no thinner than nominal 5 mm and no longer than 1.2 meters. Exposed glass edges shall be smooth.

Wired glass with wire exposed on longitudinal edges shall not be used in louvered windows or jalousies.

Where other glass types are used, the design shall be submitted to the building official for approval.

SECTION 11.15
WIND, SNOW, SEISMIC AND DEAD LOADS ON GLASS

11.15.1 **Vertical glass.** Glass sloped 15 degrees or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind loads in SBC 301 for components and cladding.

Glass in glazed curtain walls, glazed storefronts and glazed partitions shall meet the seismic requirements of SBC 301. Glazing firmly supported on all four edges is permitted to be designed by the following provisions. Where the glass is not firmly supported on all four edges, analysis or test data ensuring safe performance for the specific installation shall be prepared by a registered design professional.

The design of vertical glazing shall be based on the following equation:

$$F_{gw} \leq F_{ga}$$ **(Equation 11.15-1)**

where:

F_{gw} is the wind load on the glass computed in accordance with SBC 301 and F_{ga} is the maximum allowable load on the glass computed by the following formula:

$$F_{ga} = c_1 F_{ge}$$ **(Equation 11.15-2)**

where:

F_{ge} = Maximum allowable equivalent load, (kN/m^2) determined from ASCE 7 for the applicable glass dimensions and thickness.

c_1 = Factor determined from Table 11.15.1 based on glass type.

11.15.2 **Sloped glass.** Glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunrooms, sloped roofs and other exterior applications shall be designed to resist the most critical of the following combinations of loads.

$$F_g = W_o - D$$ **(Equation 11.15-3)**

$$F_g = W_i + D + 0.5\,S$$ **(Equation 11.15-4)**

$$F_g = 0.5 W_i + D + S$$ **(Equation 11.15-5)**

where:

D	=	Glass dead load (psf) for glass sloped 30 degrees (0.52 rad) or less from horizontal,
D	=	0.0245 tg for glass sloped more than 30 degrees (0.52 rad) from horizontal,
D	=	: 0.0245 tg cos θ,
F_g	=	Total load, (kN/m^2) on glass,
S	=	Snow load, (kN/m^2) as determined in SBC 301,
t_g	=	Total glass thickness, inches (mm) of glass panes and plies,
W_i	=	Inward wind force, (kN/m^2) as calculated in SBC 301,
W_o	=	Outward wind force, (kN/m^2) as calculated in SBC 301,
θ	=	Angle of slope from horizontal.

Table 11.15.1
C_1 Factors for Vertical and Sloped Glass[a]

Glass Type	Factor
Single Glass	
Regular (annealed)	1.0
Heat strengthened	2.0
Fully tempered	4.0
Wired	0.50
Patterned[c]	1.0
Sandblasted[d]	0.50
Laminated–regular plies[e]	0.7/0.90[f]
Laminated–heat-strengthened plies[e]	1.5/1.8[f]
Laminated–fully tempered plies[e]	3.0/3.6[f]
Insulating Glass[b]	
Regular (annealed)	1.8
Heat strengthened	3.6
Fully tempered	7.2
Laminated–regular plies[e]	1.4/1.6[f]
Laminated–heat-strengthened plies[e]	2.7/3.2[f]
Laminated–fully tempered plies[e]	5.4/6.5[f]

a. Either Table 11.15.1 or 11.15.2 shall be appropriate for sloped glass depending on whether the snow or wind load is dominant (see Section 11.15.2). For glass types (vertical or sloped) not included in the tables, refer to ASTM E 1300 for guidance.
b. Values apply for insulating glass with identical panes.
c. The value for patterned glass is based on the thinnest part of the pattern; interpolation between graphs is permitted.
d. The value for sandblasted glass is for moderate levels of sandblasting.
e. Values for laminated glass are based on the total thickness of the glass and apply for glass with two equal glass ply thicknesses.
f. The lower value applies if, for any laminated glass pane, either the ratio of the long to short dimension is greater than 2.0 or the lesser dimension divided by the thickness of the pane is 150 or less; the higher value applies in all other cases.

Exception: Unit skylights shall be designed in accordance with Section 11.16.5. The design of sloped glazing shall be based on the following equation:

$$F_g \leq F_{ga} \qquad \textbf{(Equation 11.15-6)}$$

where F_g is the maximum load on the glass determined from Equations 11.15-3 through 11.15-5, and F_{ga} is the maximum allowable load on the glass.
If F_g is determined by Equation 11.15-3 or 11.15-4 above, F_{ga} shall be computed as for vertical glazing in Section 11.15.1. If F_g is determined by Equation 11.15-5 above, F_{ga} shall be computed by the following equation:

$$F_{ga} = c_2 F_{ge} \qquad \textbf{(Equation 11.15-7)}$$

where:

F_{ge} = Maximum allowable equivalent load (kN/m^2) determined from ASCE 7 for the applicable glass dimensions and thickness.

c_2 = Factor determined from Table 11.15.2 based on glass type.

Table 11.15.2
C_2 Factors for Vertical and Sloped Glass[a]

Glass Type	Factor
Single Glass	
Regular (annealed)	0.6
Heat strengthened	1.6
Fully tempered	3.6
Wired	0.3
Patterned[c]	0.6
Laminated–regular plies[e]	0.3/0.45[e]
Laminated–heat-strengthened plies[e]	0.8/1.2[e]
Laminated–fully tempered plies[e]	1.8/2.7[e]
Insulating Glass[b]	
Regular (annealed)	1.1
Heat strengthened	2.9
Fully tempered	6.5
Laminated–regular plies[e]	0.54/0.81[e]
Laminated–heat-strengthened plies[e]	1.4/2.2[e]
Laminated–fully tempered plies[e]	3.3/4.9[e]

a. Either Table 11.15.1 or 11.15.2 shall be appropriate for sloped glass depending on whether the snow or wind load is dominant (see Section 11.15.2). For glass types (vertical or sloped) not included in the tables, refer to ASTM E1300 for guidance.
b. Values apply for insulating glass with identical panes.
c. The value for patterned glass is based on the thinnest part of the pattern; interpolation between graphs is permitted.
d. Values for laminated glass are based on the total thickness of the glass and apply for glass with two equal glass ply thicknesses.
e. The lower value applies where, for any laminated glass pane, either the ratio of the long to short dimension is greater than 2.0 or the lesser dimension divided by the thickness of the pane is 150 or less. The higher value applies in all other cases.

SECTION 11.16
SLOPED GLAZING AND SKYLIGHTS

11.16.1 **Scope.** This section applies to the installation of glass and other transparent, translucent or opaque glazing material installed at a slope more than 15 degrees (0.26 rad) from the vertical plane, including glazing materials in skylights, roofs

and sloped walls.

11.16.2 Allowable glazing materials and limitations. Sloped glazing shall be any of the following materials, subject to the listed limitations.

1. For monolithic glazing systems, the glazing material of the single light or layer shall be laminated glass with a minimum 0.76 mm polyvinyl butyral (or equivalent) interlayer, wired glass, light-transmitting plastic materials meeting the requirements of Section 11.7, heat-strengthened glass or fully tempered glass.
2. For multiple-layer glazing systems, each light or layer shall consist of any of the glazing materials specified in Item 1 above. Annealed glass is permitted to be used as specified within Exceptions 2 and 3 of Section 11.16.3.

   For additional requirements for plastic skylights, see Section 11.10. Glass-block construction shall conform to the requirements of Section SBC 305.

11.16.3 Screening. Where used in monolithic glazing systems, heat-strengthened glass and fully tempered glass shall have screens installed below the glazing material. The screens and their fastenings shall:

1. be capable of supporting twice the weight of the glazing;
2. be firmly and substantially fastened to the framing members, and
3. be installed within 100 mm of the glass.

The screens shall be constructed of a noncombustible material not thinner than No. 12 B&S gage (2.0 mm) with mesh not larger than (25 mm by 25 mm). In a corrosive atmosphere, structurally equivalent noncorrosive screen materials shall be used. Heat-strengthened glass, fully tempered glass and wired glass, when used in multiple-layer glazing systems as the bottom glass layer over the walking surface, shall be equipped with screening that conforms to the requirements for monolithic glazing systems.

Exception: In monolithic and multiple-layer sloped glazing systems, the following applies:

1. Fully tempered glass installed without protective screens where glazed between intervening floors at a slope of 30 degrees (0.52 rad) or less from the vertical plane shall have the highest point of the glass 3 meters or less above the walking surface.
2. Screens are not required below any glazing material, including annealed glass, where the walking surface below the glazing material is permanently protected from the risk of falling glass or the area below the glazing material is not a walking surface.
3. Any glazing material, including annealed glass, is permitted to be installed without screens in the sloped glazing systems of commercial or detached noncombustible greenhouses used exclusively for growing plants and not open to the public, provided that the height of the greenhouse at the ridge does not exceed 9 meters above grade.
4. Screens shall not be required within individual dwelling units in Groups R-2, R-3 and R-4 as applicable in SBC 100 where fully tempered glass is used as single glazing or as both panes in an insulating glass unit, and the following conditions are met:
   - 4.1 Each pane of the glass is 1.5 m^2 or less in area.
   - 4.2 The highest point of the glass is 3.7 meters or less above any walking surface or other accessible area.
   - 4.3 The glass thickness is 5 mm or less.

5. Screens shall not be required for laminated glass with a 0.38 mm polyvinyl butyral (or equivalent) interlayer used within individual dwelling units in Groups R-2, R-3 and R-4 as applicable in SBC within the following limits:
   5.1 Each pane of glass is $1.5m^2$ or less in area.
   5.2 The highest point of the glass is 3.7 meters or less above a walking surface or other accessible area.

11.16.4 **Framing.** In Type 1 and 2 constructions, sloped glazing and skylight frames shall be constructed of noncombustible materials. In structures where acid fumes deleterious to metal are incidental to the use of the buildings, approved pressure-treated wood or other approved noncorrosive materials are permitted to be used for sash and frames. Framing supporting sloped glazing and skylights shall be designed to resist the tributary roof loads in SBC 301. Skylights set at an angle of less than 45 degrees (0.79 rad) from the horizontal plane shall be mounted at least 100 mm above the plane of the roof on a curb constructed as required for the frame. Skylights shall not be installed in the plane of the roof where the roof pitch is less than 45 degrees (0.79 rad) from the horizontal.

Exception: Installation of a skylight without a curb shall be permitted on roofs with a minimum slope of 14 degrees (three units vertical in 12 units horizontal) in Group R-3 occupancies as applicable in Section 101.2. All unit skylights installed in a roof with a pitch flatter than 14 degrees (0.25 rad) shall be mounted at least 100 mm above the plane of the roof on a curb constructed as required for the frame unless otherwise specified in the manufacturer's installation instructions.

11.16.5 **Unit skylights.** Unit skylights shall be tested and labeled as complying with 101/I.S.2/NAFS Voluntary Performance Specification for Windows, Skylights and Glass. The label shall state the name of the manufacturer, the approved labeling agency, the product designation and the performance grade rating as specified in 101/I.S.2/NAFS. If the product manufacturer has chosen to have the performance grade of the skylight rated separately for positive and negative design pressure, then the label shall state both performance grade ratings as specified in 101/I.S.2/NAFS and the skylight shall comply with Section 11.16.5.2. If the skylight is not rated separately for positive and negative pressure, then the performance grade rating shown on the label shall be the performance grade rating determined in accordance with 101/I.S.2/NAFS for both positive and negative design pressure, and the skylight shall conform to Section 11.16.5.1.

11.16.5.1 **Unit skylights rated for the same performance grade for both positive and negative design pressure.** The design of unit skylights shall be based on the following equation:

$$F_g \leq PG \qquad \textbf{(Equation 11.16-8)}$$

where:

F_g is the maximum load on the skylight determined from Equations 11.15-3 through 11.15-5 in Section 11.15.2.

PG is the performance grade rating of the skylight.

11.16.5.2 **Unit skylights rated for separate performance grades for positive and negative design pressure.** The design of unit skylights rated for performance grade for both positive and negative design pressures shall be based on the following equations:

$$F_{gi} \leq PG_{Pos} \qquad \textbf{(Equation 11.16-9)}$$

$$F_{go} \leq PG_{Neg} \qquad \textbf{(Equation 11.16-10)}$$

where:

PG_{Pos} = is the performance grade rating of the skylight under positive design pressure,

PG_{Neg} = is the performance grade rating of the skylight under negative design pressure,

F_{gi} and F_{go} = are determined in accordance with the following: If $W_o \geq D$, where W_o is the outward wind force, kN/m^2 as calculated in SBC 301 and D is the dead weight of the glazing, kN/m^2 as determined in Section 11.15.2 for glass, or by the weight of the plastic, kN/m^2 for plastic glazing.

F_{gi} = is the maximum load on the skylight determined from Equations 11.15-4 and 11.15-5 in Section 11.15.2,

F_{go} = is the maximum load on the skylight determined from Equation 11.15-3. If $W_o < D$, where W_o is the outward wind force, kN/m^2 as calculated in SBC 301 and D is the dead weight of the glazing, kN/m^2 as determined in Section 11.15.2 for glass, or by the weight of the plastic for plastic glazing,

F_{gi} = is the maximum load on the skylight determined from Equations 11.15-3 through 11.15-5 in Section 11.15.2,

F_{go} = 0.

SECTION 11.17
SAFETY GLAZING

11.17.1 **Human impact loads.** Individual glazed areas, including glass mirrors, in hazardous locations as defined in Section 11.17.3 shall comply with Sections 11.17.1.1 through 11.17.1.5.

11.17.1.1 **CPSC 16 CFR 1201.** Except as provided in Sections 11.17.1.2 through 11.17.1.5, all glazing shall pass the test requirements of CPSC 16 CFR 1201. Glazing shall comply with the CPSC 16 CFR, Part 1201 criteria, for Category I or II as indicated in Table 11.17.1.

11.17.1.2 **Wired glass.** In other than Group E, wired glass installed in fire doors, fire windows and view panels in fire-resistant walls shall be permitted to comply with ANSI Z97.1.

11.17.1.3 **Plastic glazing.** Plastic glazing shall meet the weathering requirements of ANSI Z97.1.

11.17.1.4 **Glass block.** Glass-block walls shall comply with SBC 305.

11.17.1.5 **Louvered windows and jalousies.** Louvered windows and jalousies shall comply with Section 11.14.5.

11.17.2 **Identification of safety glazing.** Except as indicated in Section 11.17.1.2, each pane of safety glazing installed in hazardous locations shall be identified by a label specifying the labeler, whether the manufacturer or installer, and the safety glazing standard with which it complies, as well as the information specified in Section 11.14.1. The label shall be acid etched, sand blasted, ceramic fired or an embossed mark, or shall be of a type that once applied cannot be removed without being destroyed.

Exceptions:

1. For other than tempered glass, labels are not required, provided the building official approves the use of a certificate, affidavit or other evidence confirming compliance with the code requirements.
2. Tempered spandrel glass is permitted to be identified by the manufacturer with a removable paper label.

11.17.2.1 **Multilight assemblies.** Multilight glazed assemblies having individual lights not exceeding 0.09 square meters in exposed area shall have at least one light in the assembly marked as indicated in Section 11.17.2. Other lights in the assembly shall be marked "CPSC 16 CFR 1201" or "ANSI Z97.1," as appropriate.

Table 11.17.1
Minimum Category Classification of Glazing

Exposed surface area of one side of one lite	Glazing in storm or combination doors (Category class)	Glazing in doors (Category class)	Glazed panels regulated by item 7 of Section 11.17.3 (Category class)	Glazed panels regulated by item 6 of Section 11.17.3 (Category class)	Doors and enclosures regulated by item 5 of Section 11.17.3 (Category class)	Sliding glass doors patio type (Category class)
1 square meters or less	I	I	No requirement	I	II	II
More than 1 square meters	II	II	II	II	II	II

11.17.3 **Hazardous locations.** The following shall be considered specific hazardous locations requiring safety glazing materials:

1. Glazing in swinging doors except jalousies (see Section 11.17.3.1).
2. Glazing in fixed and sliding panels of sliding door assemblies and panels in sliding and bifold closet door assemblies.
3. Glazing in storm doors.
4. Glazing in unframed swinging doors.
5. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any portion of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 1.5 meters above a standing surface.
6. Glazing in an individual fixed or operable panel adjacent to a door where the nearest exposed edge of the glazing is within a 600 mm arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 1.5 meters above the walking surface.

Exceptions:
1. Panels where there is an intervening wall or other permanent barrier between the door and glazing.
2. Where access through the door is to a closet or storage area 900 mm or less in depth. Glazing in this application shall comply with Section 11.17.3, Item 7.
3. Glazing in walls perpendicular to the plane of the door in a closed position, other than the wall towards which the door swings when opened, in one- and two-family dwellings or within dwelling units in Group R-2.

7. Glazing in an individual fixed or operable panel, other than in those locations described in preceding Items 5 and 6, which meets all of the following conditions:
7.1 Exposed area of an individual pane greater than one square meter;
7.2 Exposed bottom edge less than 450 mm above the floor;
7.3 Exposed top edge greater than 900 mm above the floor; and

7.4 One or more walking surface(s) within 900 mm horizontally of the plane of the glazing.

Exception: Safety glazing for Item 7 is not required for the following installations:

1. A protective bar 38 mm or more in height, capable of withstanding a horizontal load of 730 N/m without contacting the glass, is installed on the accessible sides of the glazing 870 mm to 970 mm above the floor.
2. The outboard pane in insulating glass units or multiple glazing where the bottom exposed edge of the glass is 7.5 meters or more above any grade, roof, walking surface or other horizontal or sloped (within 45 degrees of horizontal) (0.78 rad) surface adjacent to the glass exterior.

8. Glazing in guards and railings, including structural baluster panels and nonstructural in-fill panels, regardless of area or height above a walking surface.

9. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs and spas where all of the following conditions are present:

9.1 The bottom edge of the glazing on the pool or spa side is less than 1.5 meters above a walking surface on the pool or spa side of the glazing; and

9.2 The glazing is within 1.5 meters horizontally of the water's edge of a swimming pool or spa.

10. Glazing adjacent to stairways, landings and ramps within 900 mm horizontally of a walking surface; when the exposed surface of the glass is less than 1.5 meters above the plane of the adjacent walking surface.

11. Glazing adjacent to stairways within 1.5 meters horizontally of the bottom tread of a stairway in any direction when the exposed surface of the glass is less than 1.5 meters above the nose of the tread.

Exception: Safety glazing for Item 10 or 11 is not required for the following installations where:

1. The side of a stairway, landing or ramp which has a guardrail or handrail, including balusters or in-fill panels, complying with the provisions of Section 8.12 and SBC 301; and
2. The plane of the glass is greater than 450 mm from the railing.

11.17.3.1 **Exceptions:** The following products, materials and uses shall not be considered specific hazardous locations:

1. Openings in doors through which a 75 mm sphere is unable to pass.
2. Decorative glass in Section 11.17.3, Item 1, 6 or 7.
3. Glazing materials used as curved glazed panels in revolving doors.
4. Commercial refrigerated cabinet glazed doors.
5. Glass-block panels complying with SBC 305.
6. Louvered windows and jalousies complying with the requirements of Section 11.14.5.
7. Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.

11.17.4 **Fire department access panels.** Fire department glass access panels shall be of tempered glass. For insulating glass units, all panes shall be tempered glass.

SECTION 11.18
GLASS IN HANDRAILS AND GUARDS

11.18.1 **Materials.** Glass used as structural balustrade panels in railings shall be constructed of either single fully tempered glass, laminated fully tempered glass or laminated heat-strengthened glass. Glazing in railing in-fill panels shall be of an approved safety glazing material that conforms to the provisions of Section 11.17.1.1. For all glazing types, the minimum nominal thickness shall be 6.5 mm. Fully tempered glass and laminated glass shall comply with Category II of CPSC 16 CFR 1201.

11.18.1.1 **Loads.** The panels and their support system shall be designed to withstand the loads specified in SBC 301. A safety factor of four shall be used.

11.18.1.2 **Support.** Each handrail or guard section shall be supported by a minimum of three glass balusters or shall be otherwise supported to remain in place should one baluster panel fail. Glass balusters shall not be installed without an attached handrail or guard.

11.18.1.3 **Parking garages.** Glazing materials shall not be installed in railings in parking garages except for pedestrian areas not exposed to impact from vehicles.

SECTION 11.19
GLAZING IN ATHLETIC FACILITIES

11.19.1 **General.** Glazing in athletic facilities and similar uses subject to impact loads, which forms whole or partial wall sections or which is used as a door or part of a door, shall comply with this section.

11.19.2 **Racquetball and squash courts.**

11.19.2.1 **Testing.** Test methods and loads for individual glazed areas in racquetball and squash courts subject to impact loads shall conform to those of CPSC 16 CFR, Part 1201 with impacts being applied at a height of 1.5 meters above the playing surface to an actual or simulated glass wall installation with fixtures, fittings and methods of assembly identical to those used in practice.

Glass walls shall comply with the following conditions:

1. A glass wall in a racquetball or squash court, or similar use subject to impact loads, shall remain intact following a test impact.
2. The deflection of such walls shall not be greater than 40 mm at the point of impact for a drop height of 1.2 meters.

Glass doors shall comply with the following conditions:

1. Glass doors shall remain intact following a test impact at the prescribed height in the center of the door.
2. The relative deflection between the edge of a glass door and the adjacent wall shall not exceed the thickness of the wall plus 13 mm for a drop height of 1.2 meters.

11.19.3 **Gymnasiums and basketball courts.** Glazing in multipurpose gymnasiums, basketball courts and similar athletic facilities subject to human impact loads shall comply with Category II of CPSC 16 CFR 1201.

SECTION 11.20
GLASS IN FLOORS AND SIDEWALKS

11.20.1 **General.** Glass installed in the walking surface of floors, landings, stairwells and

similar locations shall comply with Sections 11.20.2 through 11.20.4.

11.20.2 **Design load.** The design for glass used in floors, landings, stair treads and similar locations shall be determined as indicated in Section 11.20.4 based on the load that produces the greater stresses from the following:

1. The uniformly distributed unit load (F_u) from SBC 301;

2. The concentrated load (F_c) from SBC 301; or

3. The actual load (F_a) produced by the intended use.

The dead load (D) for glass in kN/m^2 shall be taken as the total thickness of the glass plies in mm by 0.0245. Load reductions allowed by SBC 301 are not permitted.

11.20.3 **Laminated glass.** Laminated glass having a minimum of two plies shall be used. The glass shall be capable of supporting the total design load, as indicated in Section 11.20.4, with any one ply broken.

11.20.4 **Design formula.** Glass in floors and sidewalks shall be designed to resist the most critical of the following combinations of loads:

$$F_g = 2F_u + D \qquad \textbf{(Equation 11.20-11)}$$

$$F_g = (8F_c / A) + D \qquad \textbf{(Equation 11.20-12)}$$

$$F_g = F_a + D \qquad \textbf{(Equation 11.20-13)}$$

where:

A = Area of rectangular glass, (m^2).

D = Glass dead load 0.0245 tg, (kN/m^2).

t_g = Total glass thickness, mm.

F_a = Actual intended use load, (kN/m^2).

F_c = Concentrated load, (kN).

F_g = Total load, (kN/m^2) on glass.

F_u = Uniformly distributed load, (kN/m^2).

The design of the glazing shall be based on

$$F_g \leq F_{ga} \qquad \textbf{(Equation 11.20-14)}$$

where F_g is the maximum load on the glass determined from the load combinations above, and F_{ga} is the maximum allowable load on the glass, computed by the following formula:

$$F_{ga} = 0.67\, c_2 F_{ge} \qquad \textbf{(Equation 11.20-15)}$$

where:

F_{ge} = Maximum allowable equivalent load, (kN/m^2), determined from ASCE 7 for the applicable glass dimensions and thickness; and

c_2 = Factor determined from Table 11.15.2 based on glass type.

The factor, c_2, for laminated glass found in Table 11.15.2 shall apply to two-ply laminates only. The value of F_a shall be doubled for dynamic applications.

CHAPTER 12
ENCROACHMENTS INTO THE PUBLIC RIGHT-OF-WAY

SECTION 12.1
GENERAL

12.1.1 **Scope.** The provisions of this chapter shall govern the encroachment of structures into the public right-of-way.

12.1.2 **Measurement.** The projection of any structure or appendage shall be the distance measured horizontally from the lot line to the outermost point of the projection.

12.1.3 **Other laws.** The provisions of this chapter shall not be construed to permit the violation of other laws or ordinances regulating the use and occupancy of public property.

12.1.4 **Drainage.** Drainage water collected from a roof, awning, canopy or marquee, and condensate from mechanical equipment shall not flow over a public walking surface.

SECTION 12.2
ENCROACHMENTS

12.2.1 **Encroachments below grade.** Encroachments below grade shall comply with Sections 12.2.1.1 through 12.2.1.3.

12.2.1.1 **Structural support.** A part of a building erected below grade that is necessary for structural support of the building or structure shall not project beyond the lot lines, except that the footings of street walls or their supports which are located at least 2.4 meters below grade shall not project more than 300 mm beyond the street lot line.

12.2.1.2 **Vaults and other enclosed spaces.** The construction and utilization of vaults and other enclosed space below grade shall be subject to the terms and conditions of the local authority or legislative body having jurisdiction.

12.2.1.3 **Areaways.** Areaways shall be protected by grates, guards or other approved means.

12.2.2 **Encroachments above grade and below 2.4 meters in height.** Encroachments into the public right-of-way above grade and below 2.4 meters in height shall be prohibited except as provided for in Sections 12.2.2.1 through 12.2.2.3. Doors and windows shall not open or project into the public right-of-way.

12.2.2.1 **Steps.** Steps shall not project more than 300 mm and shall be guarded by approved devices not less than 900 mm high, or shall be located between columns or pilasters.

12.2.2.2 **Architectural features.** Columns or pilasters, including bases and moldings shall not project more than 300 mm. Belt courses, lintels, sills, architraves, pediments and similar architectural features shall not project more than 100 mm.

12.2.2.3 **Awnings.** The vertical clearance from the public right-of-way to the lowest part of any awning, including valances, shall be 2.1 meters minimum.

12.2.3 **Encroachments 2.4 meters or more above grade.** Encroachments 2.4 meters or more above grade shall comply with Sections 12.2.3.1 through 12.2.3.4.

12.2.3.1 **Awnings, canopies, marquees and signs.** Awnings, canopies, marquees and signs shall be constructed so as to support applicable loads as specified in SBC 301. Awnings, canopies, marquees and signs with less than 4.6 meters clearance above the sidewalk shall not extend into or occupy more than two-thirds the width of the sidewalk measured from the building. Stanchions or columns that support awnings, canopies, marquees and signs shall be located not less than 600 mm in from the curb line.

12.2.3.2 **Windows, balconies, architectural features and mechanical equipment.** Where the vertical clearance above grade to projecting windows, balconies, architectural features or mechanical equipment is more than, 25 mm of encroachment is permitted for each additional 25 mm of clearance above 2.4 meters, but the maximum encroachment shall be 1.2 meters**.**

12.2.3.3 **Encroachments 4.6 meters or more above grade.** Encroachments 4.6 meters or more above grade shall not be limited.

12.2.3.4 **Pedestrian walkways.** The installation of a pedestrian walkway over a public right-of-way shall be subject to the approval of local authority. The vertical clearance from the public right-of-way to the lowest part of a pedestrian walkway shall be 4.6 meters minimum.

12.2.4 **Temporary encroachments.** Where allowed by the local authority, vestibules and storm enclosures shall not be erected for a period of time exceeding 7 months in any one year and shall not encroach more than 900 mm nor more than one-fourth of the width of the sidewalk beyond the street lot line. Temporary entrance awnings shall be erected with a minimum clearance of 2.4 meters to the lowest portion of the hood or awning where supported on removable steel or other approved noncombustible support.

CHAPTER 13
EXISTING STRUCTURES

SECTION 13.1
GENERAL

13.1.1 **Scope.** The provisions of this chapter shall control the alteration, repair, addition and change of occupancy of existing structures.

Exception: Existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300-02.

13.1.2 **Maintenance.** Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices or safeguards which are required by this code requirements shall be maintained in conformance with the code requirements edition under which installed. The owner or the owner's designated agent shall be responsible for the maintenance of buildings and structures. To determine compliance with this subsection, the building official shall have the authority to require a building or structure to be reinspected. The requirements of this chapter shall not provide the basis for removal or abrogation of fire protection and safety systems and devices in existing structures.

13.1.3 **Compliance with other codes.** Alterations, repairs, additions and changes of occupancy to existing structures shall comply with the provisions for alterations, repairs, additions and changes of occupancy in the Saudi Building Code regulations and requirements.

SECTION 13.2
DEFINITIONS

13.2.1 **Definitions.** The following term shall, for the purposes of this chapter and as used elsewhere in this code requirements, have the following meaning:

TECHNICALLY INFEASIBLE. An alteration of a building or a facility that has little likelihood of being accomplished because the existing structural conditions require the removal or alteration of a load-bearing member that is an essential part of the structural frame, or because other existing physical or site constraints prohibit modification or addition of elements, spaces or features which are in full and strict compliance with the minimum requirements for new construction and which are necessary to provide accessibility.

SECTION 13.3
ADDITIONS, ALTERATIONS OR REPAIRS

13.3.1 **Existing buildings or structures.** Additions or alterations to any building or structure shall conform with the requirements of the code for new construction. Additions or alterations shall not be made to an existing building or structure which will cause the existing building or structure to be in violation of any provisions of this code. An existing building plus additions shall comply with the height and area provisions of Chapter 3. Portions of the structure not altered and not affected by the alteration are not required to comply with the code requirements for a new structure.

Exception: For buildings and structures in flood hazard areas established in SBC 301, any additions, alterations or repairs that constitute substantial improvement of the existing structure, as defined in SBC 301, shall comply with the flood design requirements for new construction and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design.

13.3.2 **Structural.** Additions or alterations to an existing structure shall not increase the force in any structural element by more than 5 percent, unless the increased forces on the element are still in compliance with the code for new structures, nor shall the strength of any structural element be decreased to less than that required by this code requirements for new structures. Where repairs are made to structural elements of an existing building, and uncovered structural elements are found to be unsound or otherwise structurally deficient, such elements shall be made to conform to the requirements for new structures.

13.3.2.1 **Existing live load.** Where an existing structure heretofore is altered or repaired, the minimum design loads for the structure shall be the loads applicable at the time of erection, provided that public safety is not endangered thereby.

13.3.2.2 **Live load reduction.** If the approved live load is less than required by SBC 301, the areas designed for the reduced live load shall be posted in with the approved load. Placards shall be of an approved design.

13.3.3 **Nonstructural.** Nonstructural alterations or repairs to an existing building or structure are permitted to be made of the same materials of which the building or structure is constructed, provided that they do not adversely affect any structural member or the fire-resistance rating of any part of the building or structure.

13.3.4 **Stairways.** An alteration or the replacement of an existing stairway in an existing structure shall not be required to comply with the requirements of a new stairway as outlined in SBC 801 where the existing space and construction will not allow a reduction in pitch or slope.

SECTION 13.4
FIRE ESCAPES

13.4.1 **Where permitted.** Fire escapes shall be permitted only as provided for in Sections 13.4.1.1 through 13.4.1.4.

13.4.1.1 **New buildings.** Fire escapes shall not constitute any part of the required means of egress in new buildings.

13.4.1.2 **Existing fire escapes.** Existing fire escapes shall be continued to be accepted as a component in the means of egress in existing buildings only.

13.4.1.3 **New fire escapes.** New fire escapes for existing buildings shall be permitted only where exterior stairs cannot be utilized due to lot lines limiting stair size or due to the sidewalks, alleys or roads at grade level. New fire escapes shall not incorporate ladders or access by windows.

13.4.1.4 **Limitations.** Fire escapes shall comply with this section and shall not constitute more than 50 percent of the required number of exits nor more than 50 percent of the required exit capacity.

13.4.2 **Location.** Where located on the front of the building and where projecting beyond the building line, the lowest landing shall not be less than 2.1 meters or more than

3.6 meters above grade, and shall be equipped with a counterbalanced stairway to the street. In alleyways and thoroughfares less than 9.1 meters wide, the clearance under the lowest landing shall not be less than 3.7 meters.

13.4.3 **Construction.** The fire escape shall be designed to support a live load of 4.8 kPa and shall be constructed of steel or other approved noncombustible materials. Fire escapes constructed of wood not less than nominal 50 mm thick are permitted on buildings of Type 5 construction. Walkways and railings located over or supported by combustible roofs in buildings of Type 3 and 4 constructions are permitted to be of wood not less than nominal 50 mm thick.

13.4.4 **Dimensions.** Stairs shall be at least 560 mm wide with risers not more than, and treads not less than, and landings at the foot of stairs not less than 1.0 meters wide by 900 mm long, located not more than 200 mm below the door.

13.4.5 **Opening protectives.** Doors and windows along the fire escape shall be protected with 3/4-hour opening protectives.

SECTION 13.5
GLASS REPLACEMENT

13.5.1 **Conformance.** The installation or replacement of glass shall be as required for new installations.

SECTION 13.6
CHANGE OF OCCUPANCY

13.6.1 **Conformance.** No change shall be made in the use or occupancy of any building that would place the building in a different division of the same group of occupancy or in a different group of occupancies, unless such building is made to comply with the requirements of SBC for such division or group of occupancy. Subject to the approval of the building official, the use or occupancy of existing buildings shall be permitted to be changed and the building is allowed to be occupied for purposes in other groups without conforming to all the requirements of the SBC for those groups, provided the new or proposed use is less hazardous, based on life and fire risk, than the existing use.

13.6.2 **Certificate of occupancy.** A certificate of occupancy shall be issued by local authorized agency where it has been determined that the requirements for the new occupancy classification have been met.

13.6.3 **Stairways.** Existing stairways in an existing structure shall not be required to comply with the requirements of a new stairway as outlined in SBC 801 where the existing space and construction will not allow a reduction in pitch or slope.

SECTION 13.7
HISTORIC BUILDINGS

13.7.1 **Historic buildings.** The provisions of this code relating to the construction, repair, alteration, addition, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings where such buildings are judged by the local building official to not constitute a distinct life safety hazard.

13.7.2 **Flood hazard areas.** Within flood hazard areas established in accordance with SBC 301, where the work proposed constitutes substantial improvement as defined in SBC 301, the building shall be brought into conformance with SBC 301.

Exception: Historic buildings that are:

1. Listed or preliminarily determined to be eligible for listing in the local Register of Historic Places; or
2. Determined by authorized local register of historic places as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or
3. Designated as historic under a state or local historic preservation program that is approved by authorized local register of historic places.

SECTION 13.8
MOVED STRUCTURES

13.8.1 **Conformance.** Structures moved into or within the jurisdiction shall comply with the provisions of this code requirements for new structures.

SECTION 13.9
ACCESSIBILITY FOR EXISTING BUILDINGS

13.9.1 **Scope.** The provisions of Sections 13.9.1 through 13.9.8 apply to maintenance, change of occupancy, additions and alterations to existing buildings, including those identified as historic buildings.

Exception: Type B dwelling or sleeping units required by Section 9.7 are not required to be provided in existing buildings and facilities.

13.9.2 **Maintenance of facilities.** A building, facility or element that is constructed or altered to be accessible shall be maintained accessible during occupancy.

13.9.3 **Change of occupancy.** Existing buildings, or portions thereof, that undergo a change of group or occupancy shall have all of the following accessible features:

1. At least one accessible building entrance.
2. At least one accessible route from an accessible building entrance to primary function areas.
3. Signage complying with Section 9.10.
4. Accessible parking, where parking is being provided.
5. At least one accessible passenger loading zone, when loading zones are provided.
6. At least one accessible route connecting accessible parking and accessible passenger loading zones to an accessible entrance.

Where it is technically infeasible to comply with the new construction standards for any of these requirements for a change of group or occupancy, the above items shall conform to the requirements to the maximum extent technically feasible. Change of group or occupancy that incorporates any alterations or additions shall comply with this section and Sections 13.9.4, 13.9.5, 13.9.6 and 13.9.7.

13.9.4 **Additions.** Provisions for new construction shall apply to additions. An addition that affects the accessibility to, or contains an area of primary function, shall comply with the requirements in Section 13.9.6 for accessible routes.

13.9.5 **Alterations.** A building, facility or element that is altered shall comply with the

applicable provisions in Chapter 9, unless technically infeasible. Where compliance with this section is technically infeasible, the alteration shall provide access to the maximum extent technically feasible.

Exceptions:

1. The altered element or space is not required to be on an accessible route, unless required by Section 13.9.6.
2. Accessible means of egress required by SBC 801 are not required to be provided in existing buildings and facilities.

13.9.5.1 **Extent of application.** An alteration of an existing element, space or area of a building or facility shall not impose a requirement for greater accessibility than that which would be required for new construction.

Alterations shall not reduce or have the effect of reducing accessibility of a building, portion of a building or facility.

13.9.6 **Alterations affecting an area containing a primary function.** Where an alteration affects the accessibility to, or contains an area of primary function, the route to the primary function area shall be accessible. The accessible route to the primary function area shall include toilet facilities or drinking fountains serving the area of primary function.

Exceptions:

1. The costs of providing the accessible route are not required to exceed 20 percent of the costs of the alterations affecting the area of primary function.
2. This provision does not apply to alterations limited solely to windows, hardware, operating controls, electrical outlets and signs.
3. This provision does not apply to alterations limited solely to mechanical systems, electrical systems, installation or alteration of fire protection systems and abatement of hazardous materials.
4. This provision does not apply to alterations undertaken for the primary purpose of increasing the accessibility of an existing building, facility or element.

TABLE 13.9.6.3
COMPARTMENTATION VALUES

OCCUPANCY	CATEGORIES[a]				
	a Compartment size equal to or greater than $1695m^2$	b Compartment size of $930m^2$	c Compartment size of $697.5m^2$	d Compartment size of $465m^2$	e Compartment size of $232.5m^2$
A-1, A-3	0	6	10	14	18
A-2	0	4	10	14	18
A-4, B, E, S-2	0	5	10	15	20
F, M, R, S-1	0	4	10	16	22

a. For areas between categories, the compartmentation value shall be obtained by linear interpolation.

13.9.7 **Scoping for alterations.** The provisions of Sections 13.9.7.1 through 13.9.7.11 shall apply to alterations to existing buildings and facilities.

13.9.7.1 **Entrances.** Accessible entrances shall be provided in accordance with Section 9.5.

Exception: Where an alteration includes alterations to an entrance, and the building or facility has an accessible entrance, the altered entrance is not required to be accessible, unless required by Section 13.9.6. Signs complying with Section

9.10 shall be provided.

13.9.7.2 **Elevators.** Altered elements of existing elevators shall comply with ASME A17.1 and ICC/ANSI A117.1. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.

13.9.7.3 **Platform lifts.** Platform (wheelchair) lifts complying with ICC/ANSI A117.1 and installed in accordance with ASME A18.1 shall be permitted as a component of an accessible route.

13.9.7.4 **Stairs and escalators in existing buildings.** In alterations where an escalator or stair is added where none existed previously, an accessible route shall be provided in accordance with Sections 9.4.4 and 9.4.5.

13.9.7.5 **Ramps.** Where steeper slopes than allowed by SBC 801 are necessitated by space limitations, the slope of ramps in or providing access to existing buildings or facilities shall comply with Table 13.9.7.5.

13.9.7.6 **Performance areas.** Where it is technically infeasible to alter performance areas to be on an accessible route, at least one of each type of performance area shall be made accessible.

TABLE 13.9.7.5
RAMPS

SLOPE	MAXIMUM RISE
Steeper than 1:10 but not steeper than 1:8	8 mm
Steeper than 1:12 but not steeper than 1:10	15 mm

13.9.7.7 **Dwelling or sleeping units.** Where I-1, I-2 , I-3, R-1, R-2 or R-4 dwelling or sleeping units are being altered or added, the requirements of Section 9.7 for Accessible or Type A units and SBC 801 for accessible alarms apply only to the quantity of spaces being altered or added.

13.9.7.8 **Jury boxes and witness stands.** In alterations, accessible wheelchair spaces are not required to be located within the defined area of raised jury boxes or witness stands and shall be permitted to be located outside these spaces where the ramp or lift access restricts or projects into the means of egress.

13.9.7.9 **Toilet rooms.** Where it is technically infeasible to alter existing toilet and bathing facilities to be accessible, an accessible separate toilet or bathing–facility is only permitted if separate scheduled visits for each gender are provided. The unisex facility shall be located on the same floor and in the same area as the existing facilities.

13.9.7.10 **Dressing, fitting and locker rooms.** Where it is technically infeasible to provide accessible dressing, fitting or locker rooms at the same location as similar types of rooms, one accessible room on the same level shall be provided. Where separate-sex facilities are provided, accessible rooms for each sex shall be provided.

13.9.7.11 **Check-out aisles.** Where check-out aisles are altered, at least one of each check-out aisle serving each function shall be made accessible until the number of accessible check-out aisles complies with Section 9.9.

13.9.7.12 **Thresholds.** The maximum height of thresholds at doorways shall be 20 mm. Such thresholds shall have beveled edges on each side.

13.9.8 **Historic buildings.** These provisions shall apply to buildings and facilities designated as historic structures that undergo alterations or a change of occupancy, unless technically infeasible. Where compliance with the requirements for

accessible routes, ramps, entrances or toilet facilities would threaten or destroy the historic significance of the building or facility, as determined by the local authority having jurisdiction, the alternative requirements of Sections 13.9.8.1 through 13.9.8.5 for that element shall be permitted.

13.9.8.1 **Site arrival points.** At least one accessible route from a site arrival point to an accessible entrance shall be provided.

13.9.8.2 **Multilevel buildings and facilities.** An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

13.9.8.3 **Entrances.** At least one main entrance shall be accessible.

Exceptions:

1. If a main entrance cannot be made accessible, an accessible nonpublic entrance that is unlocked while the building is occupied shall be provided; or

2. If a main entrance cannot be made accessible, a locked accessible entrance with a notification system or remote monitoring shall be provided.

Signs complying with Section 9.10 shall be provided at the primary entrance and the accessible entrance.

13.9.8.4 **Toilet and bathing facilities.** Where toilet rooms are provided, at least one accessible toilet room complying with Section 9.9.2.1 shall be provided.

13.9.8.5 **Ramps.** The slope of a ramp run of 610 mm maximum shall not be steeper than one unit vertical in eight units horizontal (12 percent slope).

SECTION 13.10
COMPLIANCE ALTERNATIVES

13.10.1 **Compliance.** The provisions of this section are intended to maintain or increase the current degree of public safety, health and general welfare in existing buildings while permitting repair, alteration, addition and change of occupancy without requiring full compliance with SBC requirements, or Sections 13.1.3, and 13.3 through 13.7, except where compliance with other provisions of this code is specifically required in this section.

13.10.2 **Applicability.** Structures existing prior to THE DATE OF SBC ISSUANCE, in which there is work involving additions, alterations or changes of occupancy shall be made to conform to the requirements of this section or the provisions of Sections 13.3 through 13.7. The provisions in Sections 13.10.2.1 through 13.10.2.5 shall apply to existing occupancies that will continue to be, or are proposed to be, in Groups A, B, E, F, M, R, S and U. These provisions shall not apply to buildings with occupancies in Group H or I.

13.10.2.1 **Change in occupancy.** Where an existing building is changed to a new occupancy classification and this section is applicable, the provisions of this section for the new occupancy shall be used to determine compliance with these code requirements.

13.10.2.2 **Partial change in occupancy.** Where a portion of the building is changed to a new occupancy classification, and that portion is separated from the remainder of the building with fire barrier wall assemblies having a fire-resistance rating as required by Table 2.2.3.2 for the separate occupancies, or with approved compliance alternatives, the portion changed shall be made to conform to the provisions of this section.

Where a portion of the building is changed to a new occupancy classification, and that portion is not separated from the remainder of the building with fire separation assemblies having a fire-resistance rating as required by Table 2.2.3.2 for the separate occupancies, or with approved compliance alternatives, the provisions of

this section which apply to each occupancy shall apply to the entire building. Where there are conflicting provisions, those requirements which secure the greater public safety shall apply to the entire building or structure.

13.10.2.3 **Additions.** Additions to existing buildings shall comply with the requirements of this code requirements for new construction. The combined height and area of the existing building and the new addition shall not exceed the height and area allowed by Chapter 3. Where a fire wall that complies with SBC 801 is provided between the addition and the existing building, the addition shall be considered a separate building.

13.10.2.4 **Alterations and repairs.** An existing building or portion thereof, which does not comply with SBC requirements for new construction, shall not be altered or repaired in such a manner that results in the building being less safe or sanitary than such building is currently. If, in the alteration or repair, the current level of safety or sanitation is to be reduced, the portion altered or repaired shall conform to the requirements of SBC.

13.10.2.5 **Accessibility requirements.** All portions of the buildings proposed for change of occupancy shall conform to the accessibility provisions of Chapter 9.

13.10.3 **Acceptance.** For repairs, alterations, additions and changes of occupancy to existing buildings that are evaluated in accordance with this section, compliance with this section shall be accepted by the building official.

13.10.3.1 **Hazards.** Where the local building official determines that an unsafe condition exists, as provided for in SBC, such unsafe condition shall be abated in accordance with SBC.

13.10.3.2 **Compliance with other codes.** Buildings that are evaluated in accordance with this section shall comply with the SBC 801.

13.10.4 **Investigation and evaluation.** For proposed work covered by this section, the building owner shall cause the existing building to be investigated and evaluated in accordance with the provisions of this section.

13.10.4.1 **Structural analysis.** The owner shall have a structural analysis of the existing building made to determine adequacy of structural systems for the proposed alteration, addition or change of occupancy. The existing building shall be capable of supporting the minimum load requirements of SBC 301.

13.10.4.2 **Submittal.** The results of the investigation and evaluation as required in Section 13.10.4, along with proposed compliance alternatives, shall be submitted to the building official.

13.10.4.3 **Determination of compliance.** The local building official shall determine whether the existing building, with the proposed addition, alteration or change of occupancy, complies with the provisions of this section in accordance with the evaluation process in Sections 13.10.5 through 13.10.9.

13.10.5 **Evaluation.** The evaluation shall be comprised of three categories: fire safety, means of egress and general safety, as defined in Sections 13.10.5.1 through 13.10.5.3.

13.10.5.1 **Fire safety.** Included within the fire safety category are the structural fire resistance, automatic fire detection, fire alarm and fire suppression system features of the facility.

13.10.5.2 **Means of egress.** Included within the means of egress category are the configuration, characteristics and support features for means of egress in the facility.

13.10.5.3 General safety. Included within the general safety category are the fire safety parameters and the means of egress parameters.

13.10.6 Evaluation process. The evaluation process specified herein shall be followed in its entirety to evaluate existing buildings. Table 13.10.7 shall be utilized for tabulating the results of the evaluation. References to other sections of this code requirements indicate that compliance with those sections is required in order to gain credit in the evaluation herein outlined. In applying this section to a building with mixed occupancies, where the separation between the mixed occupancies does not qualify for any category indicated in Section 13.10.6.16, the score for each occupancy shall be determined and the lower score determined for each section of the evaluation process shall apply to the entire building.

Where the separation between the mixed occupancies qualifies for any category indicated in Section 13.10.6.16, the score for each occupancy shall apply to each portion of the building based on the occupancy of the space.

13.10.6.1 Building height. The value for building height shall be the lesser value determined by the formula in Section 13.10.6.1.1. Chapter 3 shall be used to determine the allowable height of the building, including allowable increases due to automatic sprinklers as provided for in Section 3.4.2. Subtract the actual building height from the allowable and divide by 320 mm. Enter the height value and its sign (positive or negative) in Table 13.10.7 under Safety Parameter 13.10.6.1, Building Height, for fire safety, means of egress and general safety. The maximum score for a building shall be 10.

13.10.6.1.1 Height formula. The following formulas shall be used in computing the building height value.

$$\text{Height value, meters} = \frac{(AH)-(EBH)}{0.0244} \text{ X CF} \qquad \textbf{(Equation 13-1)}$$

$$\text{Height value, stories} = (AS - EBS) \text{ X } CF$$

where:

AH = Allowable height in feet from Table 3.3.

EBH = Existing building height in feet.

AS = Allowable height in stories from Table 3.3.

EBS = Existing building height in stories.

CF = 1 if (AH) (EBH) is positive.

CF = Construction-type factor shown in Table 3409.6.6(2) if (AH) (EBH) is negative.

Note. Where mixed occupancies are separated and individually evaluated as indicated in Section 13.10.6, the values AH, AS, EBH and EBS shall be based on the height of the fire area of the occupancy being evaluated.

13.10.6.2 Building area. The value for building area shall be determined by the formula in Section 13.10.6.2.2. Section 3.3 and the formula in Section 13.10.6.2.1 shall be used to determine the allowable area of the building. This shall include any allowable increases due to open perimeter and automatic sprinklers as provided for in Section 3.6. Subtract the actual building area from the allowable area and divide by 112 m^2. Enter the area value and its sign (positive or negative) in Table 13.10.7 under Safety Parameter 13.10.6.2, Building Area, for fire safety, means of egress and general safety. In determining the area value, the maximum permitted positive value for area is 50 percent of the fire safety score as listed in Table 13.10.8, Mandatory Safety Scores.

13.10.6.2.1 **Allowable area formula.** The following formula shall be used in computing allowable area:

$$AA = \frac{(SP + OP + 100) \text{ X (area, TABLE 3.3)}}{100} \quad \textbf{(Equation 13-2)}$$

where:

AA = Allowable area.

SP = Percent increase for sprinklers (Section 3.6.3).

OP = Percent increase for open perimeter (Section 3.6.2).

13.10.6.2.2 **Area formula.** The following formula shall be used in computing the area value. Determine the area value for each occupancy fire area on a floor-by-floor basis. For each occupancy, choose the minimum area value of the set of values obtained for the particular occupancy.

$$\text{Area value } i = \frac{\text{Allowable area}_i}{1{,}200 \text{ square feet}}\left[1-\left(\frac{\text{Actual area}_i}{\text{Allowable area}_i}+\ldots+\frac{\text{Actual area}_n}{\text{Allowable area}_n}\right)\right] \quad \textbf{(Equation 13-3)}$$

where:

i = Value for an individual separated occupancy on a floor.

n = Number of separated occupancies on a floor.

13.10.6.3 **Compartmentation.** Evaluate the compartments created by fire barrier walls which comply with Sections 13.10.6.3.1 and 13.10.6.3.2 and which are exclusive of the wall elements considered under Sections 13.10.6.4 and 13.10.6.5. Conforming compartments shall be figured as the net area and do not include shafts, chases, stairways, walls or columns. Using Table 13.10.6.3, determine the appropriate compartmentation value (CV) and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.3, Compartmentation, for fire safety, means of egress and general safety.

TABLE 13.10.6.3
COMPARTMENTATION VALUES

OCCUPANCY	CATEGORIES[a]				
	a Compartment size equal to or greater than 1,394 m^2 15,000 square feet	b Compartment size of 929 m^2 10,000 square feet	c Compartment size of 697 m^2 7,500 square feet	d Compartment size of 465 m^2 5,000 square feet	e Compartment size of 232 m^2 2,500 square feet
A-1, A-3	0	6	10	14	18
A-2	0	4	10	14	18
A-4, B, E, S-2	0	5	10	15	20
F, M, R, S-1	0	4	10	16	22

a. For areas between categories, the compartmentation value shall be obtained by linear interpolation.

13.10.6.3.1 **Wall construction.** A wall used to create separate compartments shall be a fire barrier conforming to SBC 801 with a fire-resistance rating of not less than 2 hours. Where the building is not divided into more than one compartment, the compartment size shall be taken as the total floor area on all floors. Where there is more than one compartment within a story, each compartmented area on such story shall be provided with a horizontal exit conforming to Section 8.21. The fire door serving as the horizontal exit between compartments shall be so installed, fitted

and gasketed that such fire door will provide a substantial barrier to the passage of smoke.

13.10.6.3.2 **Floor/ceiling construction.** A floor/ceiling assembly used to create compartments shall conform to Section 711 and shall have a fire-resistance rating of not less than 2 hours.

13.10.6.4 **Tenant and dwelling unit separations.** Evaluate the fire-resistance rating of floors and walls separating tenants, including dwelling units, and not evaluated under Sections 13.10.6.3 and 13.10.6.5. Under the categories and occupancies in Table 13.10.6.4, determine the appropriate value and enter that value in Table 13.10.7 under Safety Parameter 13.10.6.4, Tenant and Dwelling Unit Separation, for fire safety, means of egress and general safety.

13.10.6.4.1 **Categories.** The categories for tenant and dwelling unit separations are:

1. Category a – No fire partitions; incomplete fire partitions; no doors; doors not self-closing or automatic closing.
2. Category b – Fire partitions or floor assembly less than 1-hour fire-resistance rating or not constructed in accordance with SBC 801.

TABLE 13.10.6.4
SEPARATION VALUES

OCCUPANCY	CATEGORIES				
	a	b	c	d	e
A-1	0	0	0	0	1
A-2	-5	-3	0	1	3
R	-4	-2	0	2	4
A-3, A-4, B, E, F, M, S-1	-4	-3	0	2	4
S-2	-5	-2	0	2	4

3. Category c – Fire partitions with 1 hour or greater fire-resistance rating constructed in accordance with Section 708 and floor assemblies with 1-hour but less than 2-hour fire-resistance rating constructed in accordance with SBC 801, or with only one tenant within the fire area.
4. Category d – Fire barriers with 1-hour but less than 2-hour fire-resistance rating constructed in accordance with Section 706 and floor assemblies with 2-hour or greater fire-resistance rating constructed in accordance with SBC 801.
5. Category e – Fire barriers and floor assemblies with 2-hour or greater fire-resistance rating and constructed in accordance with SBC 801.

13.10.6.5 **Corridor walls.** Evaluate the fire-resistance rating and degree of completeness of walls which create corridors serving the floor, and constructed in accordance with SBC 801. This evaluation shall not include the wall elements considered under Sections 13.10.6.3 and 13.10.6.4. Under the categories and groups in Table 13.10.6.5, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.5, Corridor Walls, for fire safety, means of egress and general safety.

TABLE 13.10.6.5
CORRIDOR WALL VALUES

OCCUPANCY	CATEGORIES			
	a	b	c[a]	d[a]
A-1	-10	-4	0	2
A-2	-30	-12	0	2
A-3, F, M, R, S-1	-7	-3	0	2
A-4, B, E, S-2	-5	-2	0	5

a. Corridors not providing at least one-half the travel distance for all occupants on a floor shall use Category b.

13.10.6.5.1 **Categories.** The categories for corridor walls are:

1. Category a – No fire partitions; incomplete fire partitions; no doors; or doors not self-closing.
2. Category b – Less than 1-hour fire-resistance rating or not constructed in accordance with Section 708.4.
3. Category c – 1-hour to less than 2-hour fire-resistance rating, with doors conforming to SBC 801 or without corridors as permitted by SBC 801.
4. Category d – 2-hour or greater fire-resistance rating, with doors conforming to SBC 801.

13.10.6.6 **Vertical openings.** Evaluate the fire-resistance rating of vertical exit enclosures, hoistways, escalator openings and other shaft enclosures within the building, and openings between two or more floors. Table 13.10.6.6(1) contains the appropriate protection values. Multiply that value by the construction-type factor found in Table 13.10.6.6(2). Enter the vertical opening value and its sign (positive or negative) in Table 13.10.7 under Safety Parameter 13.10.6.6, Vertical Openings, for fire safety, means of egress and general safety. If the structure is a one-story building, enter a value of 2. Unenclosed vertical openings that conform to the requirements of SBC 801 shall not be considered in the evaluation of vertical openings.

13.10.6.6.1 **Vertical opening formula.** The following formula shall be used in computing vertical opening value.

$$VO = PV \times CF$$ **(Equation 13-4)**

Where

VO = Vertical opening value.
PV = Protection value [Table 13.9.6.6(1)].
CF = Construction type factor [Table 13.9.6.6(2)].

TABLE 13.10.6.6(1)
VERTICAL OPENING PROTECTION VALUE

PROTECTION	VALUE
None (unprotected opening)	-2 times number floors connected
Less than 1 hour	-1 times number floors connected
1 to less than 2 hours	1
2 hours or more	2

TABLE 13.10.6.6(2)
CONSTRUCTION-TYPE FACTOR

FACTOR	TYPE OF CONSTRUCTION								
	IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
	1.2	1.5	2.2	3.5	2.5	3.5	2.3	3.3	7

13.10.6.7 **HVAC systems.** Evaluate the ability of the HVAC system to resist the movement of smoke and fire beyond the point of origin. Under the categories in Section 13.9.6.7.1, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.7, HVAC Systems, for fire safety, means of egress and general safety.

13.10.6.7.1 **Categories.** The categories for HVAC systems are:

1. Category a – Plenums not in accordance with Section 4.2 of the SBC 501 -10 points.
2. Category b – Air movement in egress elements not in accordance with SBC 801 -5 points.
3. Category c – Both categories a and b are applicable -15 points.
4. Category d – Compliance of the HVAC system with SBC 501 0 points.
5. Category e – Systems serving one story; or a central boiler/chiller system without ductwork connecting two or more stories. 5 points.

13.10.6.8 **Automatic fire detection.** Evaluate the smoke detection capability based on the location and operation of automatic fire detectors in accordance with SBC 801 and the SBC 501. Under the categories and occupancies in Table 13.10.6.8, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.8, Automatic Fire Detection, for fire safety, means of egress and general safety.

13.10.6.8.1 **Categories.** The categories for automatic fire detection are:

1. Category a – None.
2. Category b – Existing smoke detectors in HVAC systems and maintained in accordance with the SBC 801.
3. Category c – Smoke detectors in HVAC systems. The detectors are installed in accordance with the requirements for new buildings in the SBC 501.
4. Category d – Smoke detectors throughout all floor areas other than individual guestrooms, tenant spaces and dwelling units.
5. Category e – Smoke detectors installed throughout the fire area.

13.10.6.9 **Fire alarm systems.** Evaluate the capability of the fire alarm system in accordance with SBC 801. Under the categories and occupancies in Table 13.10.6.9, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.9, Fire Alarm, for fire safety, means of egress and general safety.

TABLE 13.10.6.8
AUTOMATIC FIRE DETECTION VALUES

OCCUPANCY	CATEGORIES				
	a	b	c	d	e
A-1, A-3, F, M, R, S-1	-10	-5	0	2	6
A-2	-25	-5	0	5	9
A-4, B, E, S-2	-4	-2	0	4	8

TABLE 13.10.6.9
FIRE ALARM SYSTEM VALUES

OCCUPANCY	CATEGORIES			
	a	b[a]	c	d
A-1, A-2, A-3, A-4, B, E, R	-10	-5	0	5
F, M, S	0	5	10	15

a. For buildings equipped throughout with an automatic sprinkler system, add 2 points for activation by a sprinkler water flow device

13.10.6.9.1 **Categories.** The categories for fire alarm systems are:

1. Category a – None.
2. Category b – Fire alarm system with manual fire alarm boxes in accordance with SBC 801 and alarm notification appliances in accordance with SBC 801.
3. Category c – Fire alarm system in accordance with SBC 801.
4. Category d – Category c plus a required emergency voice/alarm communications system and a fire command station that conforms to Section 2.16.8 and contains the emergency voice/alarm communications system controls, fire department communication system controls and any other controls specified in SBC 801 where those systems are provided.

13.10.6.10 **Smoke control.** Evaluate the ability of a natural or mechanical venting, exhaust or pressurization system to control the movement of smoke from a fire. Under the categories and occupancies in Table 13.10.6.10, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.10, Smoke Control, for means of egress and general safety.

13.10.6.10.1 **Categories.** The categories for smoke control are:

1. Category a – None.
2. Category b – The building is equipped throughout with an automatic sprinkler system. Openings are provided in exterior walls at the rate of 1.86 m^2 per 1.50 linear meters of exterior wall in each story and distributed around the building perimeter at intervals not exceeding 1.5 meters. Such openings shall be readily openable from the inside without a key or separate tool and shall be provided with ready access thereto. In lieu of operable openings, clearly and permanently marked tempered glass panels shall be used.
3. Category c – One enclosed exit stairway, with ready access thereto, from each occupied floor of the building. The stairway has operable exterior windows and the building has openings in accordance with Category b.
4. Category d – One smokeproof enclosure and the building has openings in accordance with Category b.
5. Category e – The building is equipped throughout with an automatic sprinkler system. Each fire area is provided with a mechanical air-handling system designed to accomplish smoke containment. Return and exhaust air shall be moved directly to the outside without recirculation to other fire areas of the building under fire conditions. The system shall exhaust not less than six air changes per hour from the fire area. Supply air by mechanical means to the fire area is not required. Containment of smoke shall be considered as confining smoke to the fire area involved without migration to other fire areas. Any other tested and approved design which will adequately accomplish smoke containment is permitted.
6. Category f – Each stairway shall be one of the following: a smokeproof enclosure in accordance with SBC 801; pressurized in accordance with SBC

801; or shall have operable exterior windows.

TABLE 13.10.6.10
SMOKE CONTROL VALUES

OCCUPANCY	CATEGORIES					
	a	**b**	**c**	**d**	**e**	**f**
A-1, A-2, A-3	0	1	2	3	6	6
A-4, E	0	0	0	1	3	5
B, M, R	0	2[a]	3[a]	3[a]	3[a]	4[a]
F, S	0	2[a]	2[a]	3[a]	3[a]	3[a]

a. This value shall be 0 if compliance with Category d or e in Section 13.10.6.8.1 has not been obtained.

13.10.6.11 **Means of egress capacity and number.** Evaluate the means of egress capacity and the number of exits available to the building occupants. In applying this section, the means of egress are required to conform to Sections 8.3 through 8.14 and 8.16 through 8.23 (except that the minimum width required by this section shall be determined solely by the width for the required capacity in accordance with Table 8.5.1). The number of exits credited is the number that are available to each occupant of the area being evaluated. Existing fire escapes shall be accepted as a component in the means of egress when conforming to Section 13.4. Under the categories and occupancies in Table 13.10.6.11, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.11, Means of Egress Capacity, for means of egress and general safety.

13.10.6.11.1 **Categories.** The categories for means of egress capacity and number of exits are:

1. Category a – Compliance with the minimum required means of egress capacity or number of exits is achieved through the use of a fire escape in accordance with Section 13.3.
2. Category b – Capacity of the means of egress complies with Section 8.4 and the number of exits complies with the minimum number required by Section 8.18.
3. Category c – Capacity of the means of egress is equal to or exceeds 125 percent of the required means of egress capacity, the means of egress complies with the minimum required width dimensions specified in the code requirements and the number of exits complies with the minimum number required by Section 8.18.
4. Category d – The number of exits provided exceeds the number of exits required by Section 8.18. Exits shall be located a distance apart from each other equal to not less than that specified in Section 8.14.2.
5. Category e – The area being evaluated meets both Categories c and d.

TABLE 13.10.6.11
MEANS OF EGRESS VALUES

OCCUPANCY	CATEGORIES				
	a[a]	b	c	d	e
A-1, A-2, A-3, A-4, E	-10	0	2	8	10
M	-3	0	1	2	4
B, F, S	-1	0	0	0	0
R	-3	0	0	0	0

a. The values indicated are for buildings six stories or less in height. For buildings over six stories in height, add an additional -10 points.

13.10.6.12 **Dead ends.** In spaces required to be served by more than one means of egress, evaluate the length of the exit access travel path in which the building occupants are confined to a single path of travel. Under the categories and occupancies in Table 13.10.6.12, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.12, Dead Ends, for means of egress and general safety.

13.10.6.12.1 **Categories.** The categories for dead ends are:

1. Category a – Dead end of 10.7 meters in nonsprinklered buildings or 21 meters in sprinklered buildings.
2. Category b – Dead end of 6.1 meters; or 15.2 meters in Group B in accordance with Section 8.16.3 exception 2.
3. Category c – No dead ends; or ratio of length to width (l/w) is less than 2.5:1.

TABLE 13.10.6.12
DEAD-END VALUES

OCCUPANCY	CATEGORIES		
	a	b	c
A-1, A-3, A-4, B, E, F, M, R, S	-2	0	2
A-2, E	-2	0	2

a. For dead-end distances between categories, the dead-end value shall be obtained by linear interpolation.

13.10.6.13 **Maximum exit access travel distance.** Evaluate the length of exit access travel to an approved exit. Determine the appropriate points in accordance with the following equation and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.13, Maximum Exit Access Travel Distance, for means of egress and general safety. The maximum allowable exit access travel distance shall be determined in accordance with Section 8.15.1.

$$\text{Points} = 20 \times \frac{\text{Maximum allowable travel distance} - \text{Maximum actual travel distance}}{\text{Max. allowable travel distance}}$$

13.10.6.14 **Elevator control.** Evaluate the passenger elevator equipment and controls that are available to the fire department to reach all occupied floors. Elevator recall controls shall be provided in accordance with the SBC 801. Under the categories and occupancies in Table 13.10.6.14, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.14, Elevator Control, for fire safety, means of egress and general safety. The values shall be zero for a

single-story building.

13.10.6.14.1 Categories. The categories for elevator controls are:

1. Category a – No elevator.
2. Category b – Any elevator without Phase I and II recall.
3. Category c – All elevators with Phase I and II recall as required by the SBC 801.
4. Category d – All meet Category c; or Category b where permitted to be without recall; and at least one elevator that complies with new construction requirements serves all occupied floors.

TABLE 13.10.6.14
ELEVATOR CONTROL VALUES

ELEVATOR TRAVEL	CATEGORIES			
	a	b	c	d
Less than 7.6 meters of travel above or below the primary level of elevator access for emergency fire-fighting or rescue personnel	-2	0	0	+2
Travel of 7.6 meters or more above or below the primary level of elevator access for emergency fire-fighting or rescue personnel	-4	NP	0	+4

13.10.6.15 Means of egress emergency lighting. Evaluate the presence of and reliability of means of egress emergency lighting. Under the categories and occupancies in Table 13.10.6.15, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.15, Means of Egress Emergency Lighting, for means of egress and general safety.

TABLE 13.10.6.15
MEANS OF EGRESS EMERGENCY LIGHTING VALUES

NUMBER OF EXITS REQUIRED BY SECTION 10.10	CATEGORIES		
	a	b	c
Two or more exits	NP	0	4
Minimum of one exit	0	1	1

13.10.6.15.1 Categories. The categories for means of egress emergency lighting are:

1. Category a – Means of egress lighting and exit signs not provided with emergency power in accordance with SBC 401.
2. Category b – Means of egress lighting and exit signs provided with emergency power in accordance with SBC 401.
3. Category c – Emergency power provided to means of egress lighting and exit signs which provides protection in the event of power failure to the site or building.

13.10.6.16 Mixed occupancies. Where a building has two or more occupancies that are not in the same occupancy classification, the separation between the mixed occupancies shall be evaluated in accordance with this section. Where there is no separation between the mixed occupancies or the separation between mixed occupancies does not qualify for any of the categories indicated in Section 13.10.6.16.1, the building shall be evaluated as indicated in Section 13.10.6 and the value for mixed occupancies shall be zero. Under the categories and occupancies in Table 13.10.6.16, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.16, Mixed Occupancies, for fire safety and general

safety. For buildings without mixed occupancies, the value shall be zero.

TABLE 13.10.6.16
MIXED OCCUPANCY VALUES [a]

OCCUPANCY	CATEGORIES		
	a	b	c
A-1, A-2, R	-10	0	10
A-3, A-4, B, E, F, M, S	-5	0	5

a. For fire-resistance ratings between categories, the value shall be obtained by linear interpolation.

13.10.6.16.1 Categories. The categories for mixed occupancies are:

1. Category a – Minimum 1-hour fire barriers between occupancies.
2. Category b – Fire barriers between occupancies in accordance with Section 2.2.3.2.
3. Category c – Fire barriers between occupancies having a fire-resistance rating of not less than twice that required by SBC 801.

13.10.6.17 Automatic sprinklers. Evaluate the ability to suppress a fire based on the installation of an automatic sprinkler system in accordance with SBC 801. "Required sprinklers" shall be based on the requirements of this code requirements. Under the categories and occupancies in Table 13.10.6.17, determine the appropriate value and enter that value into Table 13.10.7 under Safety Parameter 13.10.6.17, Automatic Sprinklers, for fire safety, means of egress divided by 2 and general safety.

TABLE 13.10.6.17
SPRINKLER SYSTEM VALUES

OCCUPANCY	CATEGORIES					
	a	b	c	d	e	f
A-1, A-3, F, M, R, S-1	-6	-3	0	2	4	6
A-2	-4	-2	0	1	2	4
A-4, B, E, S-2	-12	-6	0	3	6	12

13.10.6.17.1 Categories. The categories for automatic sprinkler system protection are:

1. Category a – Sprinklers are required throughout; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected in accordance with SBC 801.
2. Category b – Sprinklers are required in a portion of the building; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected in accordance with SBC 801.
3. Category c – Sprinklers are not required; none are provided.
4. Category d – Sprinklers are required in a portion of the building; sprinklers are provided in such portion; the system is one which complied with the code requirements at the time of installation and is maintained and supervised in accordance SBC 801.
5. Category e – Sprinklers are required throughout; sprinklers are provided throughout in accordance with SBC 801.
6. Category f – Sprinklers are not required throughout; sprinklers are provided throughout in accordance with SBC 801.

13.10.6.18 **Incidental use.** Evaluate the protection of incidental use areas in accordance with Section 2.2.1.1. Do not include those where this code requirements requires suppression throughout the building including covered mall buildings, high-rise buildings, public garages and unlimited area buildings. Assign the lowest score from Table 13.9.6.18 for the building or fire area being evaluated. If there are no specific occupancy areas in the building or fire area being evaluated, the value shall be zero.

TABLE 13.10.6.18
INCIDENTAL USE AREA VALUES[a]

PROTECTION REQUIRED BY TABLE 2A.2.1.1	PROTECTION PROVIDED						
	None	1 Hour	AFSS	AFSS with SP	1 Hour and AFSS	2 Hours	2 Hours and AFSS
2 Hours and AFSS	-4	-3	-2	-2	-1	-2	0
2 Hours, or 1 Hour and AFSS	-3	-2	-1	-1	0	0	0
1 Hour and AFSS	-3	-2	-1	-1	0	-1	0
1 Hour	-1	0	-1	0	0	0	0
1 Hour, or AFSS with SP	-1	0	-1	0	0	0	0
AFSS with SP	-1	-1	-1	0	0	-1	0
1 Hour or AFSS	-1	0	0	0	0	0	0

a. AFSS = Automatic fire suppression system; SP = Smoke partitions (See Section 2.2.1.1.1).
NOTE: For Table 13.9.7.5, see page 13/6.

13.10.7 **Building score.** After determining the appropriate data from Section 13.10.6, enter those data in Table 13.10.7 and total the building score.

13.10.8 **Safety scores.** The values in Table 13.10.8 are the required mandatory safety scores for the evaluation process listed in Section 13.10.6.

13.10.9 **Evaluation of building safety.** The mandatory safety score in Table 13.10.8 shall be subtracted from the building score in Table 13.10.7 for each category. Where the final score for any category equals zero or more, the building is in compliance with the requirements of this section for that category. Where the final score for any category is less than zero, the building is not in compliance with the requirements of this section.

13.10.9.1 **Mixed occupancies.** For mixed occupancies, the following provisions shall apply:

1. Where the separation between mixed occupancies does not qualify for any category indicated in Section 13.10.6.16, the mandatory safety scores for the occupancy with the lowest general safety score in Table 13.10.8 shall be utilized (see Section 13.10.6).
2. Where the separation between mixed occupancies qualifies for any category indicated in Section 13.10.6.16, the mandatory safety scores for each occupancy shall be placed against the evaluation scores for the appropriate occupancy.

TABLE 13.10.7
SUMMARY SHEET — BUILDING CODE

Existing occupancy ______________________________ Proposed occupancy ______________________________

Year building was constructed ______________________ Number of stories _________ Height in feet __________

Type of construction ______________________________ Area per floor ___________________________________

Percentage of open perimeter _______% Percentage of height reduction _______%

Completely suppressed: Yes _______ No _______ Corridor wall rating ______________________________

Compartmentation: Yes _______ No _______ Required door closers: Yes _________No _________

Fire-resistance rating of vertical opening enclosures ____

Type of HVAC system______________________________, serving number of floors _______________________

Automatic fire detection: Yes _______ No _______, type and location ________________________________

Fire alarm system: Yes _______ No _______, type ____

Smoke control: Yes _______ No _______, type ____

Adequate exit routes: Yes _______ No _______ Dead ends: _________ Yes _________ No __________

Maximum exit access travel distance _________________ Elevator controls: Yes _________ No _________

Means of egress emergency lighting: Yes _____No ______ Mixed occupancies: Yes_________ No _________

SAFETY PARAMETERS	FIRE SAFETY (FS)	MEANS OF EGRESS (ME)	GENERAL SAFETY (GS)
13.10.6.1 Building Height 13.10.6.2 Building Area 13.10.6.3 Compartmentation			
13.10.6.4 Tenant and Dwelling Unit Separations 13.10.6.5 Corridor Walls 13.10.6.6 Vertical Openings			
13.10.6.7 HVAC Systems 13.10.6.8 Automatic Fire Detection 13.10.6.9 Fire Alarm System			
13.10.6.10 Smoke Control 13.10.6.11 Means of Egress 13.10.6.12 Dead Ends	* * * * * * * * * * * *		
13.10.6.13 Maximum Exit Access Travel Distance 13.10.6.14 Elevator Control 13.10.6.15 Means of Egress Emergency Lighting	* * * * * * * *		
13.10.6.16 Mixed Occupancies 13.10.6.17 Automatic Sprinklers 13.10.6.18 Incidental Use		* * * * ÷ 2 =	
Building score — total value			

**** No applicable value to be inserted.

TABLE 13.10.8
MANDATORY SAFETY SCORES[a]

OCCUPANCY	FIRE SAFETY (MFS)	MEANS OF EGRESS (MME)	GENERAL SAFETY (MGS)
A-1	16	27	27
A-2	19	30	30
A-3	18	29	29
A-4, E	23	34	34
B	24	34	34
F	20	30	30
M	19	36	36
R	17	34	34
S-1	15	25	25
S-2	23	33	33

a. MFS = Mandatory Fire Safety;
MME = Mandatory Means of Egress;
MGS = Mandatory General Safety.

TABLE 13.10.9
EVALUATION FORMULAS [a]

FORMULA	T.9.10.9.7			T.9.10.9.8		SCORE	PASS	FAIL
FS-MFS ≥ 0	______	(FS)	–	______	(MFS) =	______	______	______
ME-MME ≥0	______	(ME)	–	______	(MME) =	______	______	______
GS-MGS ≥ 0	______	(GS)	–	______	(MGS) =	______	______	______

a. FS = Fire Safety — MFS = Mandatory Fire Safety
ME = Means of Egress — MME = Mandatory Means of Egress
GS = General Safety — MGS = Mandatory General Safety

CHAPTER 14
SAFEGUARDS DURING CONSTRUCTION

SECTION 14.1
GENERAL

14.1.1 **Scope.** The provisions of this chapter shall govern safety during construction and the protection of adjacent public and private properties.

14.1.2 **Storage and placement.** Construction equipment and materials shall be stored and placed so as not to endanger the public, the workers or adjoining property for the duration of the construction project.

SECTION 14.2
CONSTRUCTION SAFEGUARDS

14.2.1 **Remodeling and additions.** Required exits, existing structural elements, fire protection devices and sanitary safeguards shall be maintained at all times during remodeling, alterations, repairs or additions to any building or structure.

Exceptions:

1. When such required elements or devices are being remodeled, altered or repaired, adequate substitute provisions shall be made.

2. When the existing building is not occupied.

14.2.2 **Manner of removal.** Waste materials shall be removed in a manner which prevents injury or damage to persons, adjoining properties and public rights-of-way.

SECTION 14.3
DEMOLITION

14.3.1 **Construction documents.** Construction documents and a schedule for demolition must be submitted when required by the building official. Where such information is required, no work shall be done until such construction documents or schedule, or both, are approved.

14.3.2 **Pedestrian protection.** The work of demolishing any building shall not be commenced until pedestrian protection is in place as required by this chapter.

14.3.3 **Means of egress.** A party wall balcony or horizontal exit shall not be destroyed unless and until a substitute means of egress has been provided and approved.

14.3.4 **Vacant lot.** Where a structure has been demolished or removed, the vacant lot shall be filled and maintained to the existing grade or in accordance with the ordinances of the jurisdiction having authority.

14.3.5 **Water accumulation.** Provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

14.3.6 **Utility connections.** Service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the authority having jurisdiction.

SECTION 14.4
SITE WORK

14.4.1 **Excavation and fill.** Excavation and fill for buildings and structures shall be constructed or protected so as not to endanger life or property. Stumps and roots shall be removed from the soil to a depth of at least 300 mm below the surface of the ground in the area to be occupied by the building. Wood forms which have been used in placing concrete, if within the ground or between foundation sills and the ground, shall be removed before a building is occupied or used for any purpose. Before completion, loose or casual wood shall be removed from direct contact with the ground under the building.

14.4.1.1 **Slope limits.** Slopes for permanent fill shall not be steeper than one unit vertical in two units horizontal (50 percent slope). Cut slopes for permanent excavations shall not be steeper than one unit vertical in two units horizontal (50 percent slope). Deviation from the foregoing limitations for cut slopes shall be permitted only upon the presentation of a soil investigation report acceptable to the building official.

14.4.1.2 **Surcharge.** No fill or other surcharge loads shall be placed adjacent to any building or structure unless such building or structure is capable of withstanding the additional loads caused by the fill or surcharge. Existing footings or foundations which can be affected by any excavation shall be underpinned adequately or otherwise protected against settlement and shall be protected against later movement.

14.4.1.3 **Footings on adjacent slopes.** For footings on adjacent slopes, see SBC 303.

14.4.1.4 **Fill supporting foundations.** Fill to be used to support the foundations of any building or structure shall comply with SBC 303. Special inspections of compacted fill shall be in accordance with SBC 302.

SECTION 14.5
SANITARY

14.5.1 **Facilities required.** Sanitary facilities shall be provided during construction, remodeling or demolition activities in accordance with the SBC 701.

SECTION 14.6
PROTECTION OF PEDESTRIANS

14.6.1 **Protection required.** Pedestrians shall be protected during construction, remodeling and demolition activities as required by this chapter and Table 14.6.1. Signs shall be provided to direct pedestrian traffic.

14.6.2 **Walkways.** A walkway shall be provided for pedestrian travel in front of every construction and demolition site unless the authority having jurisdiction authorizes the sidewalk to be fenced or closed. Walkways shall be of sufficient width to accommodate the pedestrian traffic, but in no case shall they be less than 1.2 meters in width. Walkways shall be provided with a durable walking surface. Walkways shall be accessible in accordance with Chapter 9 and shall be designed to support all imposed loads and in no case shall the design live load be less than 7.2 kN/m^2.

14.6.3 **Directional barricades.** Pedestrian traffic shall be protected by a directional barricade where the walkway extends into the street. The directional barricade shall be of sufficient size and construction to direct vehicular traffic away from the pedestrian path.

TABLE 14.6.1
PROTECTION OF PEDESTRIANS

HEIGHT OF BUILDING (meters)	DISTANCE FROM CONSTRUCTION TO LOT LINE	TYPE OF PROTECTION REQUIRED
2.4 or less	Less than 1500 mm	Construction railings
	1500 mm or more	None
More than 2.4	Less than 1500 mm	Barrier and covered walkway
	1500 mm or more, but not more than one-fourth the height of construction	Barrier and covered walkway
	1500 mm or more, but between one-fourth and one-half the height of construction	Barrier
	1500 mm or more, but exceeding one-half the height of construction	None

14.6.4 **Construction railings.** Construction railings shall be at least 1.0 meter in height and shall be sufficient to direct pedestrians around construction areas.

14.6.5 **Barriers.** Barriers shall be a minimum of than 2.4 meters in height and shall be placed on the side of the walkway nearest the construction. Barriers shall extend the entire length of the construction site. Openings in such barriers shall be protected by doors which are normally kept closed.

14.6.6 **Barrier design.** Barriers shall be designed to resist loads required in SBC 301 unless constructed as follows:

1. Barriers shall be provided with 50 mm by 100 mm top and bottom plates.
2. The barrier material shall be a minimum of 20 mm boards or 6 mm wood structural use panels.
3. Wood structural use panels shall be bonded with an adhesive identical to that for exterior wood structural use panels.
4. Wood structural use panels 6 mm or 24 mm in thickness shall have studs spaced not more than 600 mm on center (o.c.).
5. Wood structural use panels 9.5 mm or 12.7 mm in thickness shall have studs spaced not more than 1.2 meters o.c., provided a 50 mm by 100 mm stiffener is placed horizontally at midheight where the stud spacing exceeds 600 mm o.c.
6. Wood structural use panels 16 mm or thicker shall not span over 2.4 meters).

14.6.7 **Covered walkways.** Covered walkways shall have a minimum clear height of 2.4 meters as measured from the floor surface to the canopy overhead. Adequate lighting shall be provided at all times. Covered walkways shall be designed to support all imposed loads. In no case shall the design live load be less than 7.2 kN/m^2 for the entire structure.

Exception: Roofs and supporting structures of covered walkways for new, light-frame construction not exceeding two stories in height are permitted to be designed for a live load of 3.6 kN/m^2) or the loads imposed on them, whichever is greater. In lieu of such designs, the roof and supporting structure of a covered walkway are permitted to be constructed as follows:

1. Footings shall be continuous 50 mm by 150 mm members.
2. Posts not less than 100 mm by 150 mm shall be provided on both sides of the roof and spaced not more than 3.7 meters o.c.
3. Stringers not less than 100 mm by 300 mm shall be placed on edge upon the posts.
4. Joists resting on the stringers shall be at least 50 mm by 200 mm (and shall be spaced not more than 600 mm o.c.
5. The deck shall be planks at least 50 mm thick or wood structural panels with an exterior exposure durability classification at least 18 mm thick nailed to the joists.
6. Each post shall be knee braced to joists and stringers by 50 mm by 100 mm minimum members 1.2 meters long.
7. A 50 mm by 100 mm minimum curb shall be set on edge along the outside edge of the deck.

14.6.8 **Repair, maintenance and removal.** Pedestrian protection required by this chapter shall be maintained in place and kept in good order for the entire length of time pedestrians may be endangered. The owner or the owner's agent, upon the completion of the construction activity, shall immediately remove walkways, debris and other obstructions and leave such public property in as good a condition as it was before such work was commenced.

14.6.9 **Adjacent to excavations.** Every excavation on a site located 1.5 meters or less from the street lot line shall be enclosed with a barrier not less than 1.8 meters high. Where located more than 1.5 meters from the street lot line, a barrier shall be erected when required by the building official. Barriers shall be of adequate strength to resist wind pressure as specified in SBC 301.

SECTION 14.7
PROTECTION OF ADJOINING PROPERTY

14.7.1 **Protection required.** Adjoining public and private property shall be protected from damage during construction, remodeling and demolition work. Protection must be provided for footings, foundations, party walls, chimneys, skylights and roofs. Provisions shall be made to control water runoff and erosion during construction or demolition activities. The person making or causing an excavation to be made shall provide written notice to the owners of adjoining buildings advising them that the excavation is to be made and that the adjoining buildings should be protected. Said notification shall be delivered not less than 10 days prior to the scheduled starting date of the excavation.

SECTION 14.8
TEMPORARY USE OF STREETS, ALLEYS AND PUBLIC PROPERTY

14.8.1 **Storage and handling of materials.** The temporary use of streets or public property for the storage or handling of materials or of equipment required for construction or demolition, and the protection provided to the public shall comply with the provisions of the authority having jurisdiction and this chapter.

14.8.1.1 **Obstructions.** Construction materials and equipment shall not be placed or stored so as to obstruct access to fire hydrants, standpipes, fire or police alarm boxes, catch basins or manholes, nor shall such material or equipment be located within

6.1 meters of a street intersection, or placed so as to obstruct normal observations of traffic signals or to hinder the use of public transit loading platforms.

14.8.2 **Utility fixtures.** Building materials, fences, sheds or any obstruction of any kind shall not be placed so as to obstruct free approach to any fire hydrant, fire department connection, utility pole, manhole, fire alarm box or catch basin, or so as to interfere with the passage of water in the gutter. Protection against damage shall be provided to such utility fixtures during the progress of the work, but sight of them shall not be obstructed.

SECTION 14.9
FIRE EXTINGUISHERS

14.9.1 **Where required.** All structures under construction, alteration or demolition shall be provided with not less than one approved portable fire extinguisher in accordance with SBC 801 and sized for not less than ordinary hazard as follows:

1. At each stairway on all floor levels where combustible materials have accumulated.
2. In every storage and construction shed.
3. Additional portable fire extinguishers shall be provided where special hazards exist, such as the storage and use of flammable and combustible liquids.

14.9.2 **Fire hazards.** The provisions of this code requirements and the SBC 801 shall be strictly observed to safeguard against all fire hazards attendant upon construction operations.

SECTION 14.10
EXITS

14.10.1 **Stairways required.** Where a building has been constructed to a height greater than 15 meters or four stories, or where an existing building exceeding 1.5 meters in height is altered, at least one temporary lighted stairway shall be provided unless one or more of the permanent stairways are erected as the construction progresses.

14.10.2 **Maintenance of exits.** Required means of egress shall be maintained at all times during construction, demolition, remodeling or alterations and additions to any building.
Exception: Approved temporary means of egress systems and facilities.

SECTION 14.11
STANDPIPES

14.11.1 **Where required.** Buildings four stories or more in height shall be provided with not less than one standpipe for use during construction. Such standpipes shall be installed where the progress of construction is not more than 12 meters in height above the lowest level of fire department access. Such standpipe shall be provided with fire department hose connections at accessible locations adjacent to usable stairs. Such standpipes shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring.

14.11.2 **Buildings being demolished.** Where a building is being demolished and a

standpipe exists within such a building, such standpipe shall be maintained in an operable condition so as to be available for use by the fire department. Such standpipe shall be demolished with the building but shall not be demolished more than one floor below the floor being demolished.

14.11.3 **Detailed requirements.** Standpipes shall be installed in accordance with the provisions of SBC 801.

Exception: Standpipes shall be either temporary or permanent in nature, and with or without a water supply, provided that such standpipes conform to the requirements of SBC 801 as to capacity, outlets and materials.

14.11.4 **Water supply.** Water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible material accumulates.

SECTION 14.12
AUTOMATIC SPRINKLER SYSTEM

14.12.1 **Completion before occupancy.** In buildings where an automatic sprinkler system is required by this code requirements, it shall be unlawful to occupy any portion of a building or structure until the automatic sprinkler system installation has been tested and approved, except as provided in SBC 801.

14.12.2 **Operation of valves.** Operation of sprinkler control valves shall be permitted only by properly authorized personnel and shall be accompanied by notification of duly designated parties. When the sprinkler protection is being regularly turned off and on to facilitate connection of newly completed segments, the sprinkler control valves shall be checked at the end of each work period to ascertain that protection is in service.

CHAPTER 15
SIGNS

SECTION 15.1
GENERAL

15.1.1 **General.** A sign shall not be erected in a manner that would confuse or obstruct the view of or interfere with exit signs required by Chapter 8 or with official traffic signs, signals or devices. Signs and sign support structures, together with their supports, braces, guys and anchors, shall be kept in repair and in proper state of preservation. The display surfaces of signs shall be kept neatly painted or posted at all times.

15.1.2 **Signs exempt from permits.** The following signs are exempt from the requirements to obtain a permit before erection:

1. Painted non-illuminated signs.
2. Temporary signs announcing the sale or rent of property.
3. Signs erected by transportation authorities.
4. Projecting signs not exceeding 0.23 m^2.
5. The changing of moveable parts of an approved sign that is designed for such changes, or the repainting or repositioning of display matter shall not be deemed an alteration.

SECTION 15.2
DEFINITIONS

15.2.1 **General.** Unless otherwise expressly stated, the following words and terms shall, for the purposes of this Chapter, have the meanings shown herein.

COMBINATION SIGN. A sign incorporating any combination of the features of pole, projecting and roof signs.

DISPLAY SIGN. The area made available by the sign structure for the purpose of displaying the advertising message.

ELECTRIC SIGN. A sign containing electrical wiring, but not including signs illuminated by an exterior light source.

GROUND SIGN. A billboard or similar type of sign which is supported by one or more uprights, poles or braces in or upon the ground other than a combination sign or pole sign, as defined by this code requirements.

POLE SIGN. A sign wholly supported by a sign structure in the ground.

PORTABLE DISPLAY SURFACE. A display surface temporarily fixed to a standardized advertising structure which is regularly moved from structure to structure at periodic intervals.

PROJECTING SIGN. A sign other than a wall sign, which projects from and is supported by a wall of a building or structure.

ROOF SIGN. A sign erected upon or above a roof or parapet of a building or structure.

SIGN. Any letter, figure, character, mark, plane, point, marquee sign, design, poster, pictorial, picture, stroke, stripe, line, trademark, reading matter or illuminated service, which shall be constructed, placed, attached, painted, erected, fastened or manufactured in any manner whatsoever, so that the same shall be used for the attraction of the public to any place, subject, person, firm, corporation, public performance, article, machine or merchandise, whatsoever, which is displayed in any manner outdoors. Every sign shall be classified and conform to the requirements of that classification as set forth in this chapter.

SIGN STRUCTURE. Any structure which supports or is capable of supporting a sign as defined in this code. A sign structure is permitted to be a single pole and is not required to be an integral part of the building.

WALL SIGN. Any sign attached to or erected against the wall of a building or structure, with the exposed face of the sign in a plane parallel to the plane of said wall.

SECTION 15.3
LOCATION

15.3.1 **Location restrictions.** Signs shall not be erected, constructed or maintained so as to obstruct any fire escape or any window or door or opening used as a means of egress or so as to prevent free passage from one part of a roof to any other part thereof. A sign shall not be attached in any form, shape or manner to a fire escape, nor be placed in such manner as to interfere with any opening required for ventilation.

SECTION 15.4
IDENTIFICATION

15.4.1 **Identification.** Every outdoor advertising display sign hereafter erected, constructed or maintained, for which a permit is required shall be plainly marked with the name of the person, firm or corporation erecting and maintaining such sign and shall have affixed on the front thereof the permit number issued for said sign or other method of identification approved by the authorized building official.

SECTION 15.5
DESIGN AND CONSTRUCTION

15.5.1 **General requirements.** Signs shall be designed and constructed to comply with the provisions of this code for use of materials, loads and stresses.

15.5.2 **Permits, drawings and specifications.** Where a permit is required, as provided in SBC 100, construction documents shall be required. These documents shall show the dimensions, material and required details of construction, including loads, stresses and anchors.

15.5.3 **Wind load.** Signs shall be designed and constructed to withstand wind pressure as provided for in SBC 301.

15.5.4 **Seismic load.** Signs designed to withstand wind pressures shall be considered capable of withstanding earthquake loads, except as provided for in SBC 301.

15.5.5 **Working stresses.** In outdoor advertising display signs, the allowable working stresses shall conform to the requirements of SBC 301. The working stresses of wire rope and its fastenings shall not exceed 25 percent of the ultimate strength of the rope or fasteners.

Exceptions:

1. The allowable working stresses for steel shall be in accordance with the provisions of SBC 306.
2. The working strength of chains, cables, guys or steel rods shall not exceed one-fifth of the ultimate strength of such chains, cables, guys or steel.

15.5.6 **Attachment.** Signs attached to masonry, concrete or steel shall be safely and securely fastened by means of metal anchors, bolts or approved expansion screws of sufficient size and anchorage to safely support the loads applied.

SECTION 15.6
ELECTRICAL

15.6.1 **Illumination.** A sign shall not be illuminated by other than electrical means, and electrical devices and wiring shall be installed in accordance with the requirements of the SBC 401. Any open spark or flame shall not be used for display purposes unless specifically approved.

15.6.1.1 **Internally illuminated signs.** Except as provided for in Sections 2.15.14 and 11.11, where internally illuminated signs have sign facings of wood or approved plastic, the area of such facing section shall not be more than 11.16 m^2 and the wiring for electric lighting shall be entirely enclosed in the sign cabinet with a clearance of not less than 50 mm from the facing material. The dimensional limitation of 11.16 m^2 shall not apply to sign facing sections made from flame resistant-coated fabric (ordinarily known as “flexible sign face plastic”) that weighs less than 678 g/m^2 and which, when tested in accordance with NFPA 701, meets the requirements of both the small-scale test and the large-scale test, or which, when tested in accordance with an approved test method, exhibits an average burn time for 10 specimens of 2 seconds or less and a burning extent of 150 mm or less.

15.6.2 **Electrical service.** Signs that require electrical service shall comply with the SBC 401.

SECTION 15.7
COMBUSTIBLE MATERIALS

15.7.1 **Use of combustibles.** Wood, approved plastic or plastic veneer panels as provided for in Chapter 11, or other materials of combustible characteristics similar to wood, used for moldings, cappings, nailing blocks, letters and latticing, shall comply with Section 15.9.1, and shall not be used for other ornamental features of signs, unless approved.

15.7.1.1 **Plastic materials.** Notwithstanding any other provisions of this code, plastic materials which burn at a rate no faster than 64 mm/s when tested in accordance with ASTM D 635 shall be deemed approved plastics and can be used as the display surface material and for the letters, decorations and facings on signs and

outdoor display structures.

15.7.1.2 **Electric sign faces.** Individual plastic facings of electric signs shall not exceed 18.6 m^2 in area.

15.7.1.3 **Area limitation.** If the area of a display surface exceeds 18.6 m^2, the area occupied or covered by approved plastics shall be limited to 18.6 m^2 plus 50 percent of the difference between 18.6 m^2 and the area of display surface. The area of plastic on a display surface shall not in any case exceed 102 m^2.

15.7.1.4 **Plastic appurtenances.** Letters and decorations mounted on an approved plastic facing or display surface can be made of approved plastics.

SECTION 15.8
ANIMATED DEVICES

15.8.1 **Fail-safe device.** Signs that contain moving sections or ornaments shall have fail-safe provisions to prevent the section or ornament from releasing and falling or shifting its center of gravity more than 380 mm. The fail-safe device shall be in addition to the mechanism and the mechanism's housing which operate the movable section or ornament. The fail-safe device shall be capable of supporting the full dead weight of the section or ornament when the moving mechanism releases.

SECTION 15.9
GROUND SIGNS

15.9.1 **Height restrictions.** The structural frame of ground signs shall not be erected of combustible materials to a height of more than 10.6 meters above the ground. Ground signs constructed entirely of noncombustible material shall not be erected to a height of greater than 30.5 meters above the ground. Greater heights are permitted where approved and located so as not to create a hazard or danger to the public.

15.9.2 **Required clearance.** The bottom coping of every ground sign shall be not less than 900 mm above the ground or street level, which space can be filled with platform decorative trim or light wooden construction.

15.9.3 **Wood anchors and supports.** Where wood anchors or supports are embedded in the soil, the wood shall be pressure treated with an approved preservative.

SECTION 15.10
ROOF SIGNS

15.10.1 **General.** Roof signs shall be constructed entirely of metal or other approved noncombustible material except as provided for in Sections 15.6.1.1 and 15.7.1. Provisions shall be made for electric grounding of metallic parts. Where combustible materials are permitted in letters or other ornamental features, wiring and tubing shall be kept free and insulated there from. Roof signs shall be so constructed as to leave a clear space of not less than 1.8 meters between the roof level and the lowest part of the sign and shall have at least 1.5 meters clearance between the vertical supports thereof. No portion of any roof sign structure shall project beyond an exterior wall.

Exception: Signs on flat roofs with every part of the roof accessible.

15.10.2 **Bearing plates.** The bearing plates of roof signs shall distribute the load directly to or upon masonry walls, steel roof girders, columns or beams. The building shall be designed to avoid overstress of these members.

15.10.3 **Height of solid signs.** A roof sign having a solid surface shall not exceed, at any point, a height of 7.3 meters measured from the roof surface.

15.10.4 **Height of open signs.** Open roof signs in which the uniform open area is not less than 40 percent of total gross area shall not exceed a height of 2.3 meters on buildings of Type 1 or Type 2 construction. On buildings of other construction types, the height shall not exceed 12.2 meters. Such signs shall be thoroughly secured to the building upon which they are installed, erected or constructed by iron, metal anchors, bolts, supports, chains, stranded cables, steel rods or braces and they shall be maintained in good condition.

10.10.5 **Height of closed signs.** A closed roof sign shall not be erected to a height greater than 15.24 meters above the roof of buildings of Type 1 or Type 2 construction, nor more than 10.6 meters above the roof of buildings of Type 3, 4 or 5 constructions.

SECTION 15.11
WALL SIGNS

15.11.1 **Materials.** Wall signs which have an area exceeding 3.72 m^2 shall be constructed of metal or other approved noncombustible material, except for nailing rails and as provided for in Sections 15.6.1.1 and 15.7.1.

15.11.2 **Exterior wall mounting details.** Wall signs attached to exterior walls of solid masonry, concrete or stone shall be safely and securely attached by means of metal anchors, bolts or expansion screws of not less than 9.5 mm diameter and shall be embedded at least 127 mm. Wood blocks shall not be used for anchorage, except in the case of wall signs attached to buildings with walls of wood. A wall sign shall not be supported by anchorages secured to an unbraced parapet wall.

15.11.3 **Extension.** Wall signs shall not extend above the top of the wall, nor beyond the ends of the wall to which the signs are attached unless such signs conform to the requirements for roof signs, projecting signs or ground signs.

SECTION 15.12
PROJECTING SIGNS

15.12.1 **General.** Projecting signs shall be constructed entirely of metal or other noncombustible material and securely attached to a building or structure by metal supports such as bolts, anchors, supports, chains, guys or steel rods. Staples or nails shall not be used to secure any projecting sign to any building or structure. The dead load of projecting signs not parallel to the building or structure and the load due to wind pressure shall be supported with chains, guys or steel rods having net cross-sectional dimension of not less than 9.5 mm diameter. Such supports shall be erected or maintained at an angle of at least 45 percent (0.78 rad) with the horizontal to resist the dead load and at angle of 45 percent (0.78 rad) or more with the face of the sign to resist the specified wind pressure. If such projecting sign exceeds 2.8 m^2 in one facial area, there shall be provided at least two such supports

on each side not more than 2.4 meters apart to resist the wind pressure.

15.12.2 **Attachment of supports.** Supports shall be secured to a bolt or expansion screw that will develop the strength of the supporting chains, guys or steel rods, with a minimum 16 mm bolt or lag screw, by an expansion shield. Turn buckles shall be placed in chains, guys or steel rods supporting projecting signs.

15.12.3 **Wall mounting details.** Chains, cables, guys or steel rods used to support the live or dead load of projecting signs are permitted to be fastened to solid masonry walls with expansion bolts or by machine screws in iron supports, but such supports shall not be attached to an unbraced parapet wall. Where the supports must be fastened to walls made of wood, the supporting anchor bolts must go through the wall and be plated or fastened on the inside in a secure manner.

15.12.4 **Height limitation.** A projecting sign shall not be erected on the wall of any building so as to project above the roof or cornice wall or above the roof level where there is no cornice wall; except that a sign erected at a right angle to the building, the horizontal width of which sign is perpendicular to such a wall and does not exceed 460 mm, is permitted to be erected to a height not exceeding 600 mm above the roof or cornice wall or above the roof level where there is no cornice wall. A sign attached to a corner of a building and parallel to the vertical line of such corner shall be deemed to be erected at a right angle to the building wall.

15.12.5 **Additional loads.** Projecting sign structures which will be used to support an individual on a ladder or other servicing device, whether or not specifically designed for the servicing device, shall be capable of supporting the anticipated additional load, but not less than a 445 N concentrated horizontal load and a 1334 N concentrated vertical load applied at the point of assumed or most eccentric loading. The building component to which the projecting sign is attached shall also be designed to support the additional loads.

SECTION 15.13
MARQUEE SIGNS

15.13.1 **Materials.** Marquee signs shall be constructed entirely of metal or other approved noncombustible material except as provided for in Sections 15.6.1.1 and 15.7.1.

15.13.2 **Attachment.** Marquee signs shall be attached to approve marquees that are constructed in accordance with Section 4.4.6.

15.13.3 **Dimensions.** Marquee signs, whether on the front or side, shall not project beyond the perimeter of the marquee.

15.13.4 **Height limitation.** Marquee signs shall not extend more than 1800 mm above, nor 300 mm below such marquee, but under no circumstances shall the sign or signs have a vertical dimension greater than 2.4 meters.

SECTION 15.14
PORTABLE SIGNS

15.14.1 **General.** Portable signs shall conform to requirements for ground, roof,

projecting, flat and temporary signs where such signs are used in a similar capacity. The requirements of this section shall not be construed to require portable signs to have connections to surfaces, tie-downs or foundations where provisions are made by temporary means or configuration of the structure to provide stability for the expected duration of the installation.

TABLE 15.14-A
SIZE, THICKNESS AND TYPE OF GLASS PANELS IN SIGNS

Maximum size of exposed panel		**Minimum thickness of glass** (mm)	**Types of glass**
Any dimension (mm)	**Area** (m^2)		
7620	0.3 m^2	4 mm	Plain, plate or wired
11430	0.45 m^2	5 mm	Plain, plate or wired
3658	2.3 m^2	6 mm	Plain, plate or wired
>3658	>2.3 m^2	6 mm	wired glass

TABLE 15.14-B
THICKNESS OF PROJECTION SIGN

Projection (mm)	**Maximum thickness** (mm)
1520	600
1200	760
900	900
600	1000
300	300

CHAPTER 16
RODENT PROOFING

SECTION 16.1
GENERAL

16.1.1 **General.** Buildings or structures and the walls enclosing habitable rooms or rooms that can be occupied and spaces in which persons live, sleep or work, or in which feed, food or foodstuffs are stored, prepared, processed, served or sold, shall be constructed in accordance with the provisions of this section.

16.1.2 **Foundation wall ventilation openings.** Foundation wall ventilator openings shall be covered for their height and width with perforated sheet metal plates no less than 1.8 mm thick, expanded sheet metal plates not less than 1.2 mm thick, cast iron grills or grating, extruded aluminum load-bearing vents or with hardware cloth of 0.89 mm wire or heavier. The openings therein shall not exceed 6 mm.

16.1.3 **Foundation and exterior wall sealing.** Annular spaces around pipes, electric cables, conduits, or other openings in the walls shall be protected against the passage of rodents by closing such openings with cement mortar, concrete masonry or non-corrosive metal.

16.1.4 **Doors.** Doors on which metal protection has been applied shall be hinged so as to be free swinging. When closed, the maximum clearance between any door, door jambs and sills shall not be greater than 9.5 mm.

16.1.5 **Windows and other openings.** Windows and other openings for the purpose of light or ventilation located in exterior walls within 600 mm above the existing ground level immediately below such opening shall be covered for their entire height and width, including frame, with hardware cloth of at least 0.9 mm wire or heavier.

16.1.5.1 **Rodent-accessible openings.** Windows and other openings for the purpose of light and ventilation in the exterior walls not covered in this chapter, accessible to rodents by way of exposed pipes, wires, conduits and other appurtenances, shall be covered with wire cloth of at least 0.9 mm wire. In lieu of wire cloth covering, said pipes, wires, conduits and other appurtenances shall be blocked from rodent usage by installing solid sheet metal guards 0.6 mm thick or heavier. Guards shall be fitted around pipes, wires, conduits or other appurtenances. In addition, they shall be fastened securely to and shall extend perpendicularly from the exterior wall for a minimum distance of 300 mm beyond and on either side of pipes, wires, conduits or appurtenances.

16.1.6 **Pier and wood construction.**

16.1.6.1 **Sill less than 300 mm above ground.** Buildings not provided with a continuous foundation shall be provided with protection against rodents at grade by providing either an apron in accordance with Section 16.1.6.1.1 or a floor slab in accordance with Section 16.1.6.1.2.

16.1.6.1.1 **Apron.** Where an apron is provided, the apron shall not be less than 203 mm above, nor less than 600 mm below, grade. The apron shall not terminate below the lower edge of the siding material. The apron shall be constructed of an approved non-decay able, water-resistant rat proofing material of required strength

and shall be installed around the entire perimeter of the building. Where constructed of masonry or concrete materials, the apron shall not be less than 100 mm in thickness.

16.1.6.1.2 **Grade floors.** Where continuous concrete grade floor slabs are provided, open spaces shall not be left between the slab and walls, and openings in the slab shall be protected.

16.1.6.2 **Sill at or above 300 mm above ground.** Buildings not provided with a continuous foundation and which have sills 300 mm or more above the ground level shall be provide with protection against rodents at grade in accordance with any of the following:

1. Section 16.1.6.1.1 or 16.1.6.1.2;
2. By installing solid sheet metal collars at least 0.6 mm thick at the top of each pier or pile and around each pipe, cable, conduit, wire or other item which provides a continuous pathway from the ground to the floor; or
3. By encasing the pipes, cables, conduits or wires in an enclosure constructed in accordance with Section 16.1.6.1.1.

REFERENCED STANDARDS

These are the standards referenced within SBC 201. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title. The application of the referenced standards shall be as specified in SBC.

1. AA, ADM 1—00, Aluminum Design Manual: Part 1-A Aluminum Structures, Allowable Stress Design; and Part 1-B —Aluminum Structures, Load and Resistance Factor Design of Buildings and Similar Type Structures, Aluminum Association, 900 - 19th Street N.W., Suite 300, Washington, DC 20006.
2. AA, ASM 35—80, Aluminum Sheet Metal Work in Building Construction, Aluminum Association, 900 - 19th Street N.W., Suite 300, Washington, DC 20006.
3. AAMA, 1402—86, Standard Specifications for Aluminum Siding, Soffit and Fascia, American Architectural Manufacturers Association, 1827 Waldon Office Square, Suite 104, Schaumburg, IL 60173.
4. AAMA, 101/I.S.2—97, Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors, American Architectural Manufacturers Association, 1827 Waldon Office Square, Suite 104, Schaumburg, IL 60173.
5. AAMA, 101/I.S.2/NAFS—02, Voluntary Performance Specification for Window, Skylights and Glass Doors, American Architectural Manufacturers Association, 1827 Waldon Office Square, Suite 104, Schaumburg, IL 60173.
6. ANSI, A 13.1—96, Scheme for the Identification of Piping Systems, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
7. ANSI, A 42.2—71, Portland Cement and Portland Cement Lime Plastering, Exterior (Stucco) and Interior, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
8. ANSI, A 42.3—71, Lathing and Furring for Portland Cement and Portland Cement Lime Plastering, Exterior Stucco and Interior, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
9. ANSI, A108.1A—99, Installation of Ceramic Tile in the Wet-set Method, with Portland Cement Mortar, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
10. ANSI, A108.1B—99, Installation of Ceramic Tile, Quarry Tile on a Cured Portland Cement Mortar Setting Bed with Dry-set or Latex-Portland Mortar, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
11. ANSI, A108.4—99, Installation of Ceramic Tile with Organic Adhesives or Water-cleanable Tile-Setting Epoxy Adhesive, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
12. ANSI, A108.5—99, Installation of Ceramic Tile with Dry-set Portland Cement Mortar or Latex Portland Cement Mortar, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
13. ANSI, A108.6—99, Installation of Ceramic Tile with Chemical-resistant, Water Cleanable Tile-setting-and-grouting Epoxy, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
14. ANSI, A108.7—92, Specification for Electrically Conductive Ceramic Tile Installed with Conductive Dry-set Portland Cement Mortar, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
15. ANSI, A108.8—99, Installation of Ceramic Tile with Chemical-resistant Furan Resin Mortar and Grout, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
16. ANSI, A108.9—99, Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

17. ANSI, A 108.10—99, Installation of Grout in Tilework, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
18. ANSI, A 118.1—99, American National Standard Specifications for Dry-set Portland Cement Mortar, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
19. ANSI, A 118.2—99, American National Standard Specifications for Conductive Dry-set Portland Cement Mortar, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
20. ANSI, A 118.3—99, American National Standard Specifications for Chemical-resistant, Water-cleanable Tile-setting and -Grouting Epoxy and Water Cleanable Tile-setting Epoxy Adhesive, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
21. ANSI, A 118.4—99, American National Standard Specifications for Latex-Portland Cement Mortar, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
22. ANSI, A 118.5—99, American National Standard Specifications for Chemical Resistant Furan Mortar and Grouts for Tile Installation, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
23. ANSI, A 118.6—99, American National Standard Specifications for Cement Grouts for Tile Installation, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
24. ANSI, A 118.8—99, American National Standard Specifications for Modified Epoxy Emulsion Mortar/Grout, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
25. ANSI, A 136.1—99, American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
26. ANSI, A 137.1—88, American National Standard Specifications for Ceramic Tile, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
27. ANSI, A 208.1—99, Particleboard, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
28. ANSI, B 31.3—99, Process Piping—Including Addendum, American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
29. ANSI, Z 97.1—84, (R1994), Safety Glazing Materials Used in Buildings-safety Performance Specifications and Methods of Test (Reaffirmed 1994), American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
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31. ASCE/CEI, 5—02, Building Code Requirements for Masonry Structures, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
32. ASCE/CEI, 6—02, Specifications for Masonry Structures, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
33. ASCE/CEI, 7—02, Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
34. ASCE/CEI, 8—90, Standard Specification for the Design of Cold-formed Stainless Steel Structural Members, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

35. ASCE/CEI, 16—95, Standard for Load Resistance Factor Design (LRFD) for Engineered Wood Construction, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
36. ASCE/CEI, 19—96, Structural Applications of Steel Cables for Buildings, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
37. ASCE/CEI, 24—98, Flood Resistant Design and Construction, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
38. ASCE/CEI, 29—99, Standard Calculation Methods for Structural Fire Protection, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
39. ASCE/CEI, 32—01, Design and Construction of Frost Protected Shallow Foundations, American Society of Civil Engineers, Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
40. ASTM, A 6/A 6M— 01b, Specification for General Requirements for Rolled Steel, Structural Steel Bars, Plates, Shapes, and Sheet Piling, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
41. ASTM, A 36/A 36M—00, Specification for Carbon Structural Steel, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
42. ASTM, A 82—01, Specification for Steel Wire, Plain, for Concrete Reinforcement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
43. ASTM, A 123/A 123M—97e1, Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
44. ASTM, A 153—01a, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
45. ASTM, A 167—99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
46. ASTM, A 185—01, Specification for Steel Welded Wire Reinforcement, Plain for Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
47. ASTM, A 252—E01, Specification for Welded and Seamless Steel Pipe Piles, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
48. ASTM, A 283/A 283M—00, Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
49. ASTM, A 307—00, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
50. ASTM, A 416—99, Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
51. ASTM, A 421/A 421M—98, Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
52. ASTM, A 435/A 435M—90 (2001), Specification for Straight-Beam Ultrasonic Examination of Steel Plates, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

53. ASTM, A 496—01, Specification for Steel Wire, Deformed for Concrete Reinforcement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
54. ASTM, A 510—00, Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
55. ASTM, A 568/A 568M—01, Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
56. ASTM, A 572/A 572M—01, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
57. ASTM, A 588/A 588M—01, Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 Mpa) Minimum Yield Point to 4 inches (100 mm) Thick, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
58. ASTM, A 615/A 615M—00, Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
59. ASTM, A 641/A 641M—98, Specification for Zinc-coated (Galvanized) Carbon Steel Wire, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
60. ASTM, A 653/A 653M—01a, Specification for Steel Sheet, Zinc-coated Galvanized or Zinc-iron Alloy-Coated Galvannealed by the Hot-dip Process, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
61. ASTM, A 706/A 706M—00, Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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63. ASTM, A 722/A 722M—98, Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
64. ASTM, A 755/A 755M—01, Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
65. ASTM, A 767/A 767M—00b, Specification for Zinc-coated (Galvanized) Steel Bars for Concrete Reinforcement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
66. ASTM, A 775/A 775M—01, Specification for Epoxy-Coated Steel Reinforcing Bars, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
67. ASTM, A 792/A 792M—01a, Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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69. ASTM, A 884—99, Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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72. ASTM, A 913/A 913M—01, Specification for High-strength Low-Alloy Steel Shapes of Structural Quality, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.Produced by Quenching and Self-tempering Process (QST), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
73. ASTM, A 951—00, Specification for Masonry Joint Reinforcement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
74. ASTM, A 996/A 996M—00, Specification for Rail-Steel and Axle-Steel Deformed Bars Reinforcement for Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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77. ASTM, B 43—98, Specification for Seamless Red Brass Pipe, Standard Sizes, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
78. ASTM, B 68M—99, Specification for Seamless Copper Tube, Bright Annealed (Metric), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
79. ASTM, B 88—99el, Specification for Seamless Copper Water Tube, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
80. ASTM, B 101—01, Specification for Lead-Coated Copper Sheet and Strip for Building Construction, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
81. ASTM, B 209—96, Specification for Aluminum and Aluminum Alloy Steel and Plate, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
82. ASTM, B 251—97, Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
83. ASTM, B 280—99el, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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85. ASTM, C 5—97, Specification for Quicklime for Structural Purposes, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
86. ASTM, C 22/C 22M—00, Specification for Gypsum, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
87. ASTM, C 27—98, Specification for Standard Classification of Fireclay and High-Alumina Refractory Brick, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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89. ASTM, C 31/31M—98, Practice for Making and Curing Concrete Test Specimens in the Field, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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92. ASTM, C 34—96 (2001), Specification for Structural Clay Load-bearing Wall Tile, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
93. ASTM, C 35—95 (2001), Specification for Inorganic Aggregates for Use in Gypsum Plaster, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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99. ASTM, C 56—96 (2001), Specification for Structural Clay Non-load Bearing Tile, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
100. ASTM, C 59/C 59M—00, Specification for Gypsum Casting and Molding Plaster, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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102. ASTM, C 62—01, Specification for Building Brick (Solid Masonry Units Made from Clay or Shale), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
103. ASTM, C 67—02, Test Methods of Sampling and Testing Brick and Structural Clay Tile, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
104. ASTM, C 73—99a, Specification for Calcium Silicate Face Brick (Sand-lime Brick), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
105. ASTM, C 79—01, Specification for Treated Core and Non-treated Core Gypsum Sheathing Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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107. ASTM, C 91—01, Specification for Masonry Cement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
108. ASTM, C 94/C 94M—00, Specification for Ready-Mixed Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
109. ASTM, C 126—99, Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
110. ASTM, C 140—01 ae1, Test Method Sampling and Testing Concrete Masonry Units and Related Units, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
111. ASTM, C 150—99a, Specification for Portland Cement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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116. ASTM, C 207—97, Specification for Hydrated Lime for Masonry Purposes, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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118. ASTM, C 207—97, Specification for Hydrated Lime for Masonry Purposes, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
119. ASTM, C 208—95, Specification for Cellulosic Fiber Insulating Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
120. ASTM, C 212—00, Specification for Structural Clay Facing Tile, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
121. ASTM, C 216—01A, Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
122. ASTM, C 270—01A, Specification for Mortar for Unit Masonry, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
123. ASTM, C 315—00, Specification for Clay Flue Linings, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
124. ASTM, C 317/C 317M—00, Specification for Gypsum Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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127. ASTM, C 406—00, Specification for Roofing Slate, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
128. ASTM, C 442/C 442M—01, Specification for Gypsum Backing Board and Coreboard and Gypsum Shaftliner Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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132. ASTM, C 475—01, Specification for Joint Compound and Joint Tape for Finishing Gypsum Wallboard, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
133. ASTM, C 476—01, Specification for Grout for Masonry, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
134. ASTM, C 503—99e01, Specification for Marble Dimension Stone (Exterior), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

135. ASTM, C 514—01, Specification for Nails for the Application of Gypsum Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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137. ASTM, C 547—00, Specification for Mineral Fiber Pipe Insulation, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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140. ASTM, C 568—99, Specification for Limestone Dimension Stone, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
141. ASTM, C 587—97, Specification for Gypsum Veneer Plaster, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
142. ASTM, C 588/C 588M—01, Specification for Gypsum Base for Veneer Plasters, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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146. ASTM, C 616—99, Specification for Quartz-based Dimension Stone, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
147. ASTM, C 618—99, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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149. ASTM, C 630/C 630M—01, Specification for Water-resistant Gypsum Backing Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
150. ASTM, C 631—00, Specification for Bonding Compounds for Interior Gypsum Plastering, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
151. ASTM, C 635—00, Specification for the Manufacturer, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
152. ASTM, C 636—96, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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154. ASTM, C 652—01A, Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
155. ASTM, C 685/ C 685M—98a, Specification for Concrete Made by Volumetric Batching and Continuous Mixing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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157. ASTM, C 754—00, Specification for Installation of Steel Framing Members to Receive Screw-attached Gypsum Panel Products, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
158. ASTM, C 836—00, Specification for High-solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
159. ASTM, C 840—01, Specification for Application and Finishing of Gypsum Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
160. ASTM, C 841—99, Specification for Installation of Interior Lathing and Furring, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
161. ASTM, C 842—99, Specification for Application of Interior Gypsum Plaster, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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165. ASTM, C 847—00, Specification for Metal Lath, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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172. ASTM, C 946—91 (2001), Specification for Practice for Construction of Dry-stacked, Surface-bonded Walls, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
173. ASTM, C 954—00, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch (0.84 mm) to 0.112 inch (2.84 mm) in Thickness, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
174. ASTM, C 955—01, Specification for Load Bearing Transverse and Axial Steel Studs, Runners Tracks, and Bracing or Bridging, for Screw Application of Gypsum Panel Products and Metal Plaster Bases, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
175. ASTM, C 956—97, Specification for Installation of Cast-in-place Reinforced Gypsum Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
176. ASTM, C 957—98, Specification for High-solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane with Integral Wearing Surface, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

177. ASTM, C 960—97, Specification for Predecorated Gypsum Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
178. ASTM, C 989—99, Specification for Ground Granulated Blast-furnace Slag for Use in Concrete and Mortars, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
179. ASTM, C1002—01, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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181. ASTM, C1019—00B, Test Method of Sampling and Testing Grout, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
182. ASTM, C1029—96, Specification for Spray-applied Rigid Cellular Polyurethane Thermal Insulation, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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184. ASTM, C1047—99, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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186. ASTM, C1088—01A, Specification for Thin Veneer Brick Units Made from Clay or Shale, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
187. ASTM, C1157—00, Performance Specification for Hydraulic Cement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
188. ASTM, C1167—96, Specification for Clay Roof Tiles, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
189. ASTM, C1177/C1177M—01, Specification for Glass Mat Gypsum Substrate for Use as Sheathing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
190. ASTM, C1178/C1178M—01, Specification for Glass Mat Water-resistant Gypsum Backing Panel, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
191. ASTM, C1186—99, Specification for Flat Nonasbestos Fiber Cement Sheets, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
192. ASTM, C1218/ C1218M—99, Test Method for Water-soluble Chloride in Mortar and Concrete, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
193. ASTM, C1240—00E1, Specification for Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar and Grout, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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195. ASTM, C1278/C 1278M—01, Specification for Fiber-reinforced Gypsum Panels, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
196. ASTM, C1280—99, Specification for Application of Gypsum Sheathing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

197. ASTM, C1283—00, Practice for Installing Clay Flue Liners, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
198. ASTM, C1314—02, Test Method for Compressive Strength of Masonry Prisms, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
199. ASTM, C1328—00, Specification for Plastic (Stucco Cement), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
200. ASTM, C1329—00, Specification for Mortar Cement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
201. ASTM, C1395/1395M—01, Specification for Gypsum Ceiling Board, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
202. ASTM, D 25—99E01, Specification for Round Timber Piles, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
203. ASTM, D 41—E01, Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
204. ASTM, D 43—00, Coal Tar Primer Used in Roofing, Dampproofing and Waterproofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
205. ASTM, D 56—01, Test Method for Flash Point By Tag Closed Tester, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
206. ASTM, D 86—01e01, Test Method for Distillation of Petroleum Products, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
207. ASTM, D 93—00, Test Method for Flash Point By Pensky-Martens Closed Cup Tester, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
208. ASTM, D 224—89 (1996), Specification for Smooth-Surfaced Asphalt Roll Roofing (Organic Felt), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
209. ASTM, D 225—01, Specification for Asphalt Shingles (Organic Felt) Surfaced with Mineral Granules, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
210. ASTM, D 226—97a, Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
211. ASTM, D 227—97a, Specification for Coal-tar-saturated Organic Felt Used in Roofing and Waterproofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
212. ASTM, D 249—89 (1996), Specification for Asphalt Roll Roofing (Organic Felt) Surfaced with Mineral Granules, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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214. ASTM, D 371—89 (1996), Specification for Asphalt Roll Roofing (Organic Felt) Surfaced with Mineral Granules: Wide-selvage, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
215. ASTM, D 422—98, Test Method for Particle-size Analysis of Soils, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
216. ASTM, D 450—00, Specification for Coal-tar Pitch Used in Roofing, Dampproofing and Waterproofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
217. ASTM, D 635—98, Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

218. ASTM, D1143—81 (1994) E01, Test Method for Piles Under Static Axial Compressive Load, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
219. ASTM, D1227—00, Specification for Emulsified Asphalt Used as a Protective Coating for Roofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
220. ASTM, D1557—00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft3 (2,700 KN m/m^3)), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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226. ASTM, D2166—00, Test Method for Unconfined Compressive Strength of Cohesive Soil, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
227. ASTM, D2178—97a, Specification for Asphalt Glass Felt Used in Roofing and Waterproofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
228. ASTM, D2216—98, Test Method for Laboratory Determination of Water(Moisture) Content of Soil and Rock by Mass, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
229. ASTM, D2487—00, Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
230. ASTM, D2626—97b, Specification for Asphalt Saturated and Coated Organic Felt Base Sheet Used in Roofing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
231. ASTM, D2822—91(97) el, Specification for Asphalt Roof Cement, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
232. ASTM, D2823—90(97) el, Specification for Asphalt Roof Coatings, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
233. ASTM, D2843—99, Test for Density of Smoke from the Burning or Decomposition of Plastics, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
234. ASTM, D2850—95(1999), Test Method for Unconsolidated, Undrained Triaxial Compression Test on Cohesive Soils, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
235. ASTM, D2898—94 (1999), Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

236. ASTM, D3019—e01(Supp), Specification for Lap Cement Used with Asphalt Roll Roofing, Nonfibered, Asbestos Fibered, and Nonasbestos Fibered, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
237. ASTM, D3161—99a, Test Method for a Wind Resistance of Asphalt Shingles (Fan Induced Method), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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239. ASTM, D3278—96e01, Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
240. ASTM, D3462—E01, Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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242. ASTM, D3679—01c(Supp), Specification for Rigid Poly [Vinyl Chloride (PVC) Siding], ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
243. ASTM, D3689—90 (1995), Method for Testing Individual Piles Under Static Axial Tensile Load, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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247. ASTM, D3909—97b, Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
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INDEX

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

W